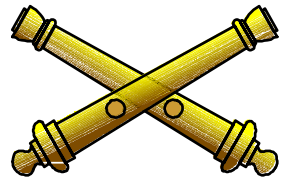


GD01NS

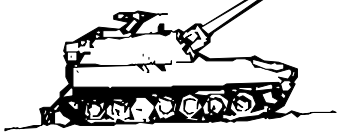
PRINCIPLES OF REGISTRATION

GUNNERY DEPARTMENT

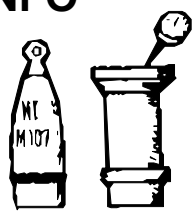
FIVE REQUIREMENTS FOR ACCURATE PREDICTED FIRE

4
ACCURATE MET INFO

2
ACCURATE BATTERY LOCATION



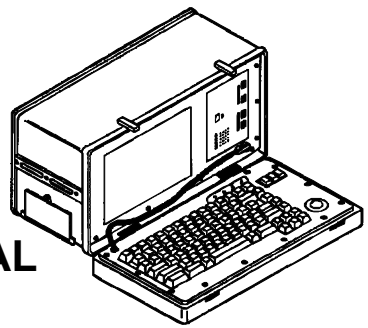
3
ACCURATE WPN & AMMO INFO



ACCURATE TARGET LOCATION AND SIZE

1

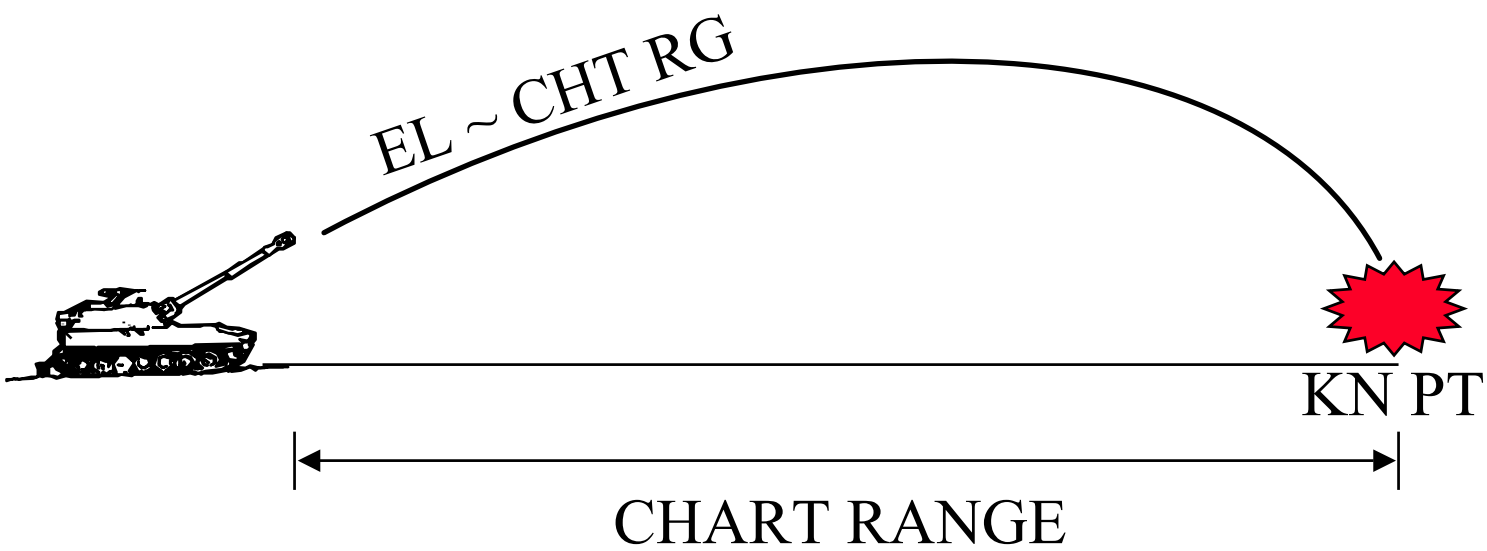
5
ACCURATE COMPUTATIONAL PROCEDURES



USAFAS

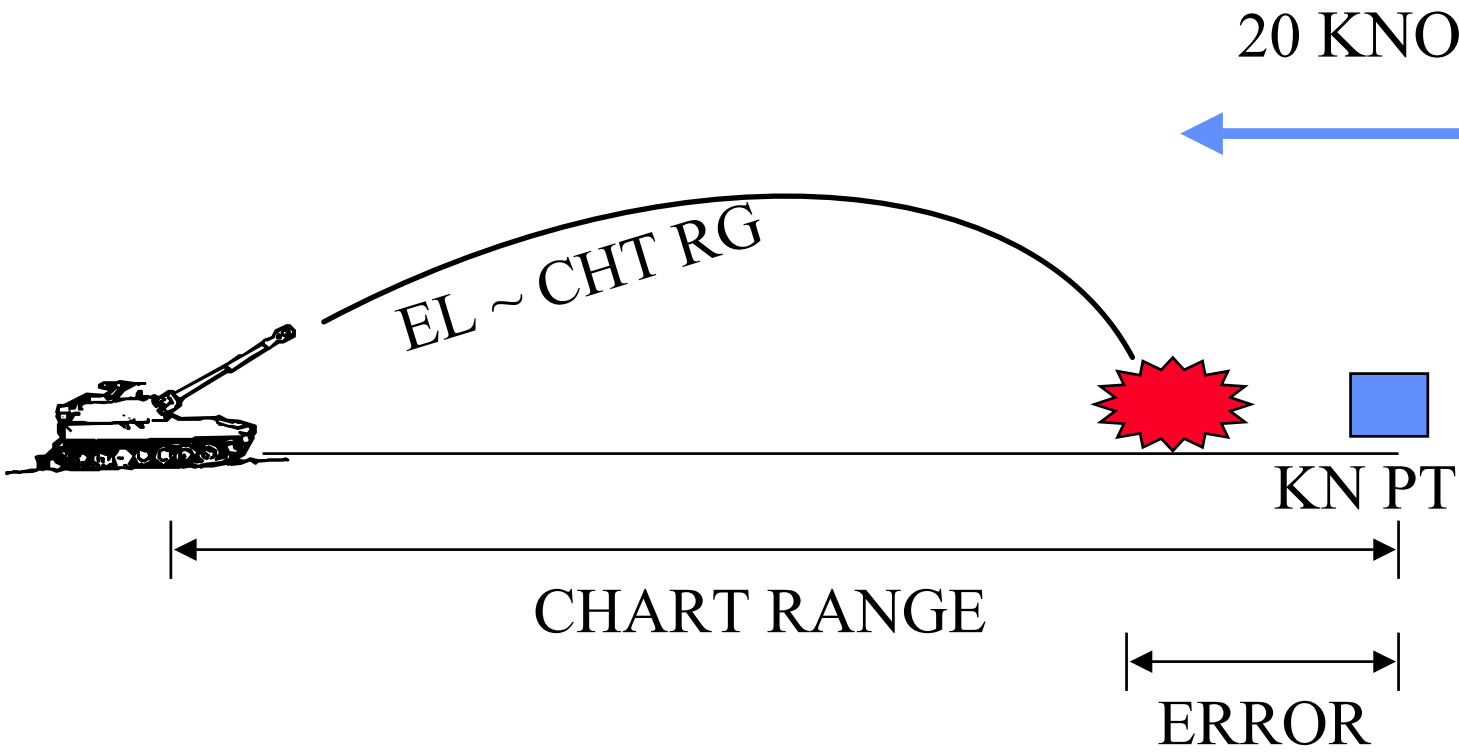
EFFECTS OF NON-STANDARD CONDITIONS

STANDARD CONDITIONS



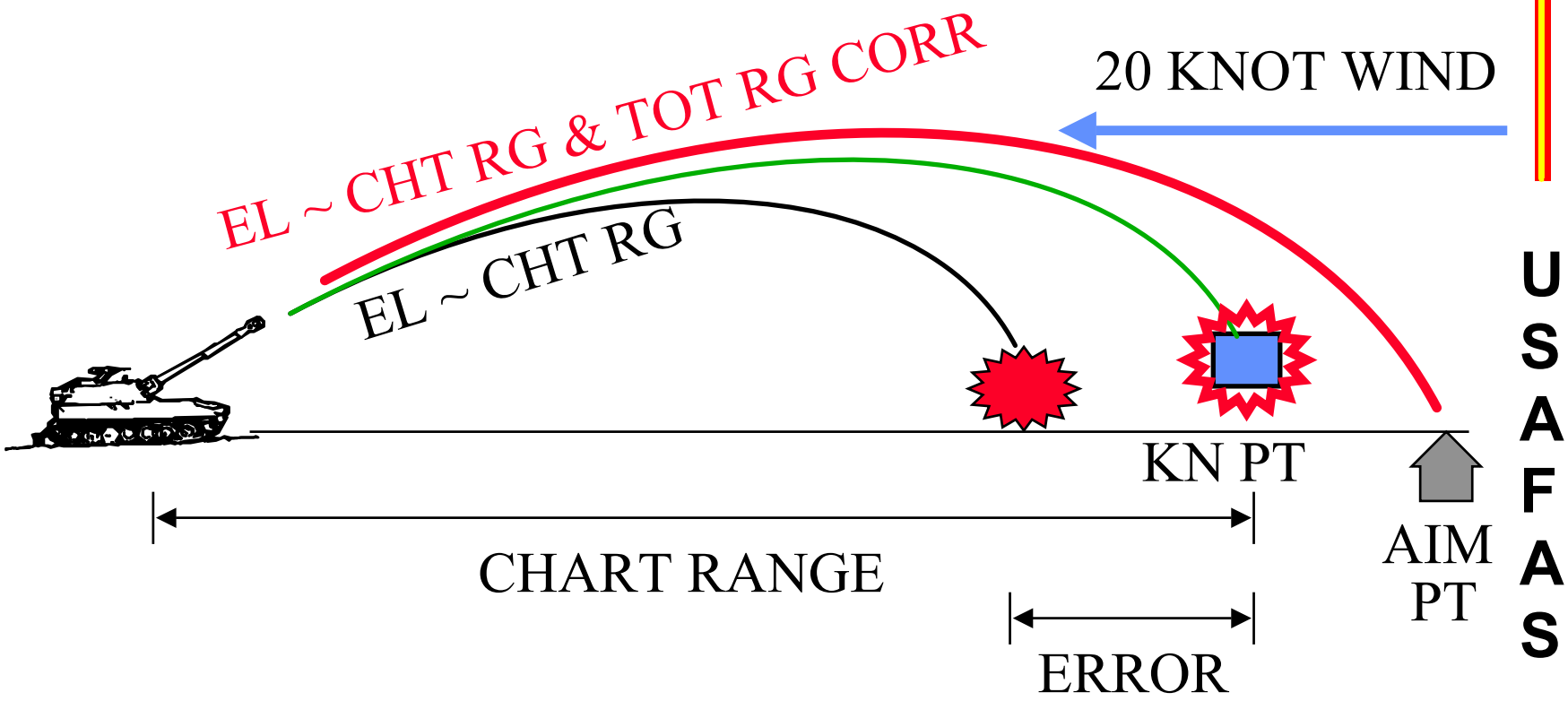
EFFECTS OF NON-STANDARD CONDITIONS

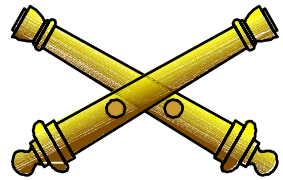
NON-STANDARD CONDITIONS



EFFECTS OF NON-STANDARD CONDITIONS

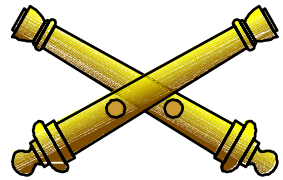
NON-STANDARD CONDITIONS





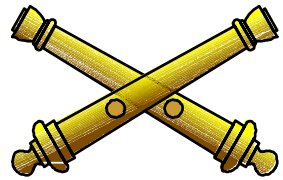
ERRORS

- HUMAN ERRORS
- CONSTANT ERRORS
- INHERENT ERRORS



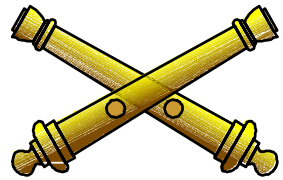
HUMAN ERRORS

- MISTAKES IN READING/SETTING UP DATA
- INACCURATE RANGE OR DIRECTION
- CARELESSNESS IN BORESIGHTING & LAYING



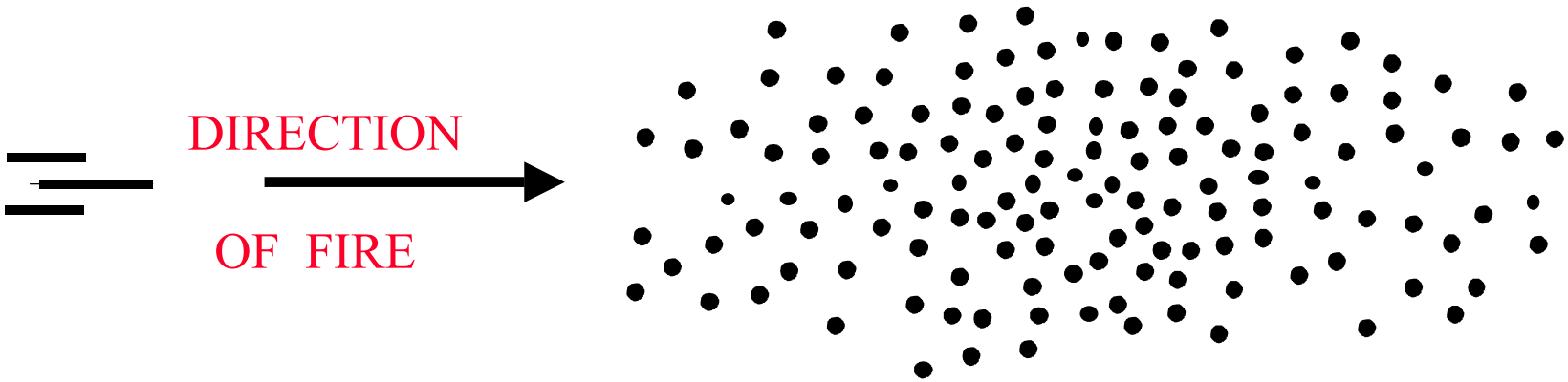
CONSTANT ERRORS

- DRIFT
- ROTATION OF THE EARTH
- WEIGHT OF THE PROJECTILE
- PROPELLANT TEMPERATURE
- DIFFERENCE IN ALTITUDE
- ATMOSPHERE DIFFERING FROM STANDARD (WEATHER)

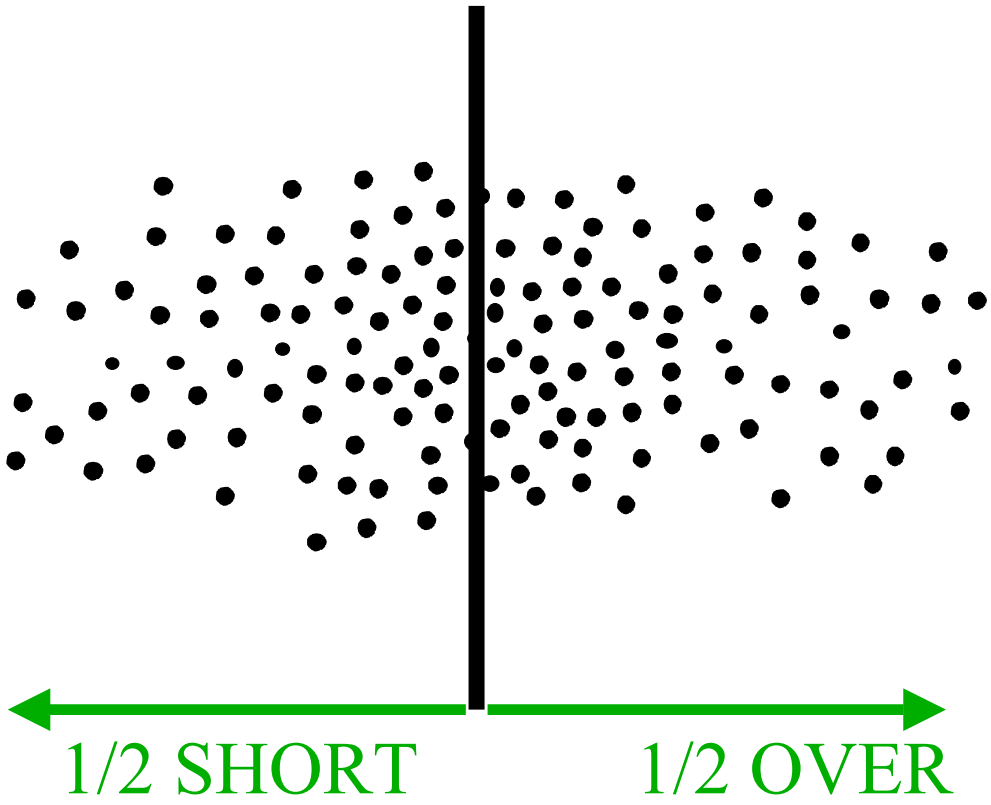


INHERENT ERRORS

- CONDITIONS IN THE BORE
- CONDITIONS IN THE CARRIAGE
- CONDITIONS DURING FLIGHT

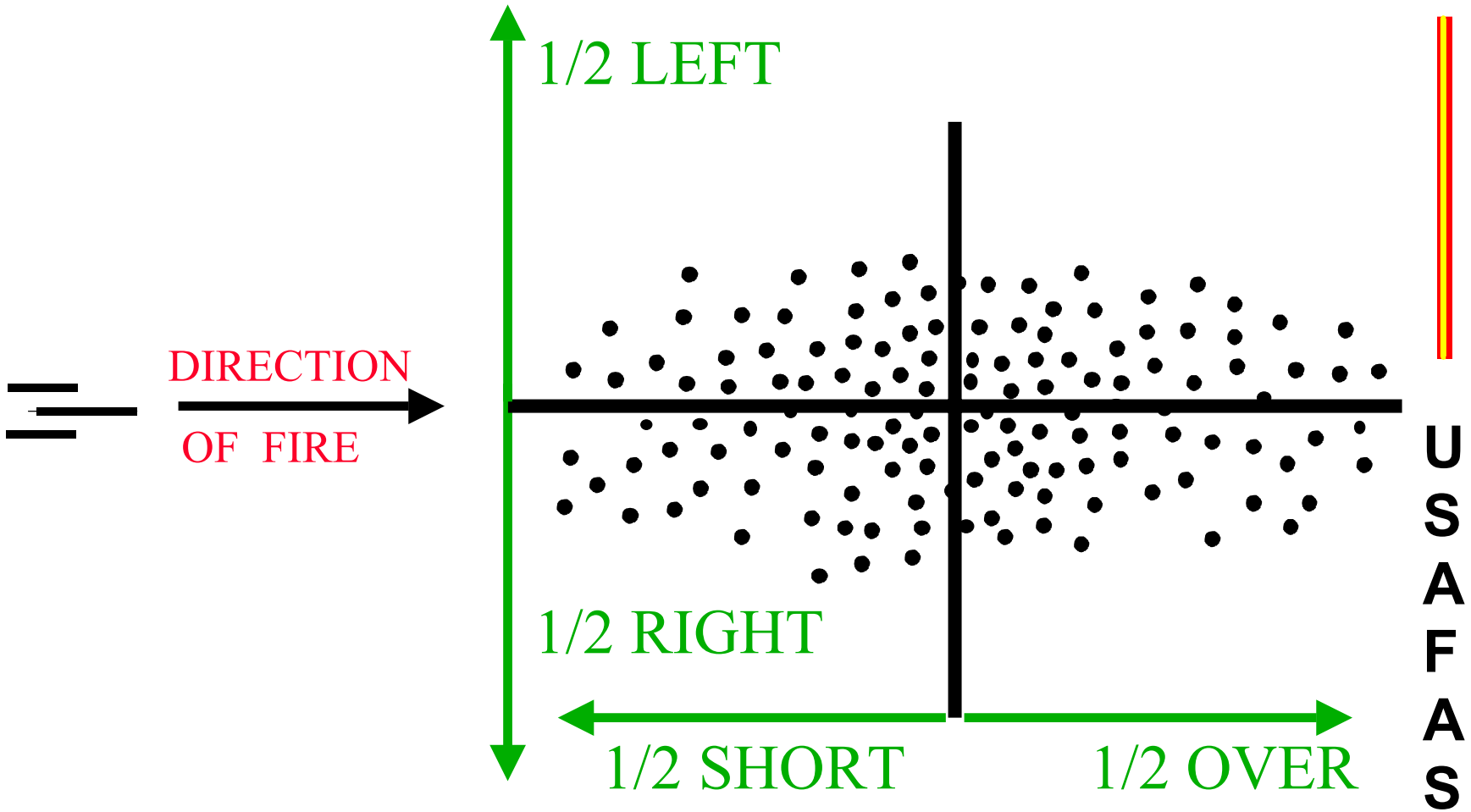

DIRECTION
OF FIRE

GUNNERY DEPARTMENT

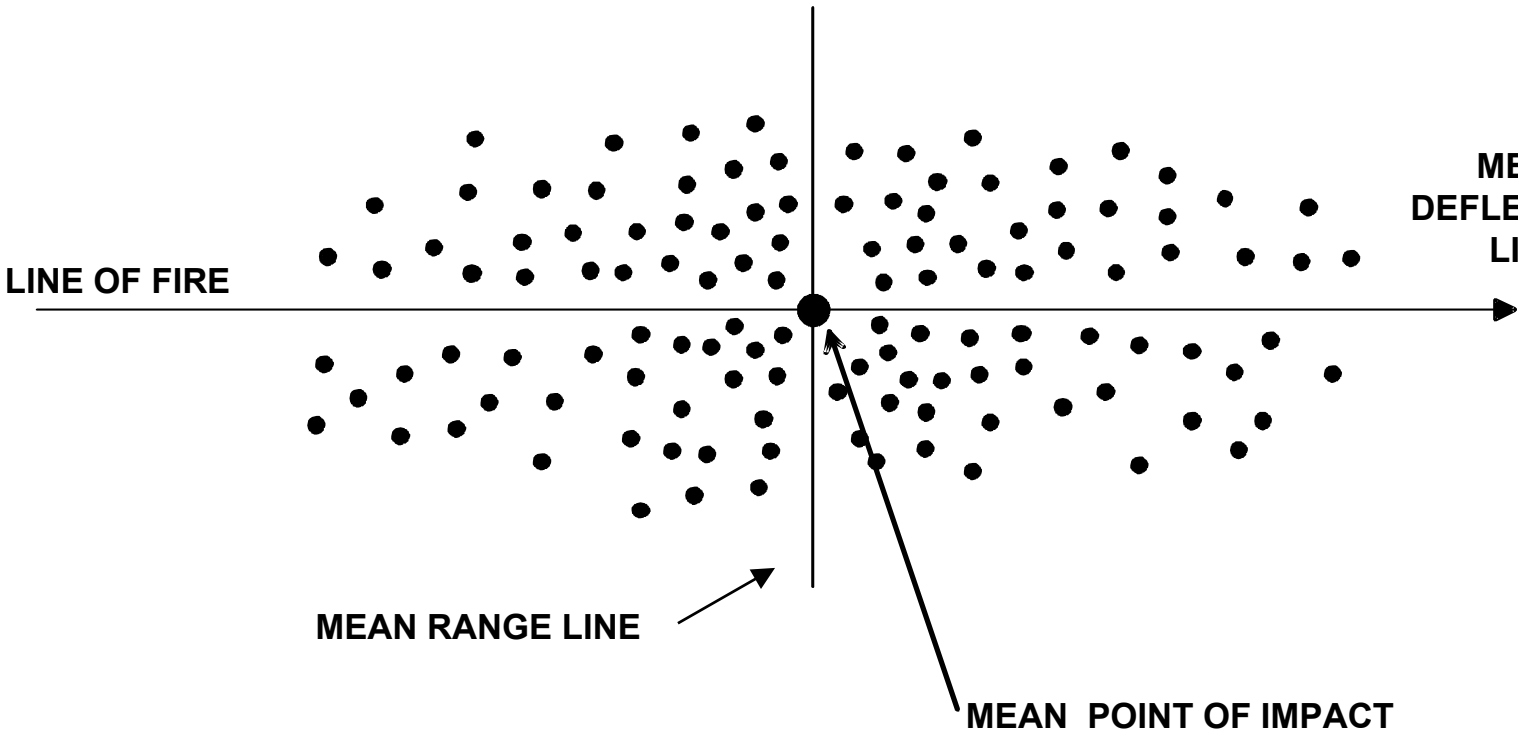


USAFAS

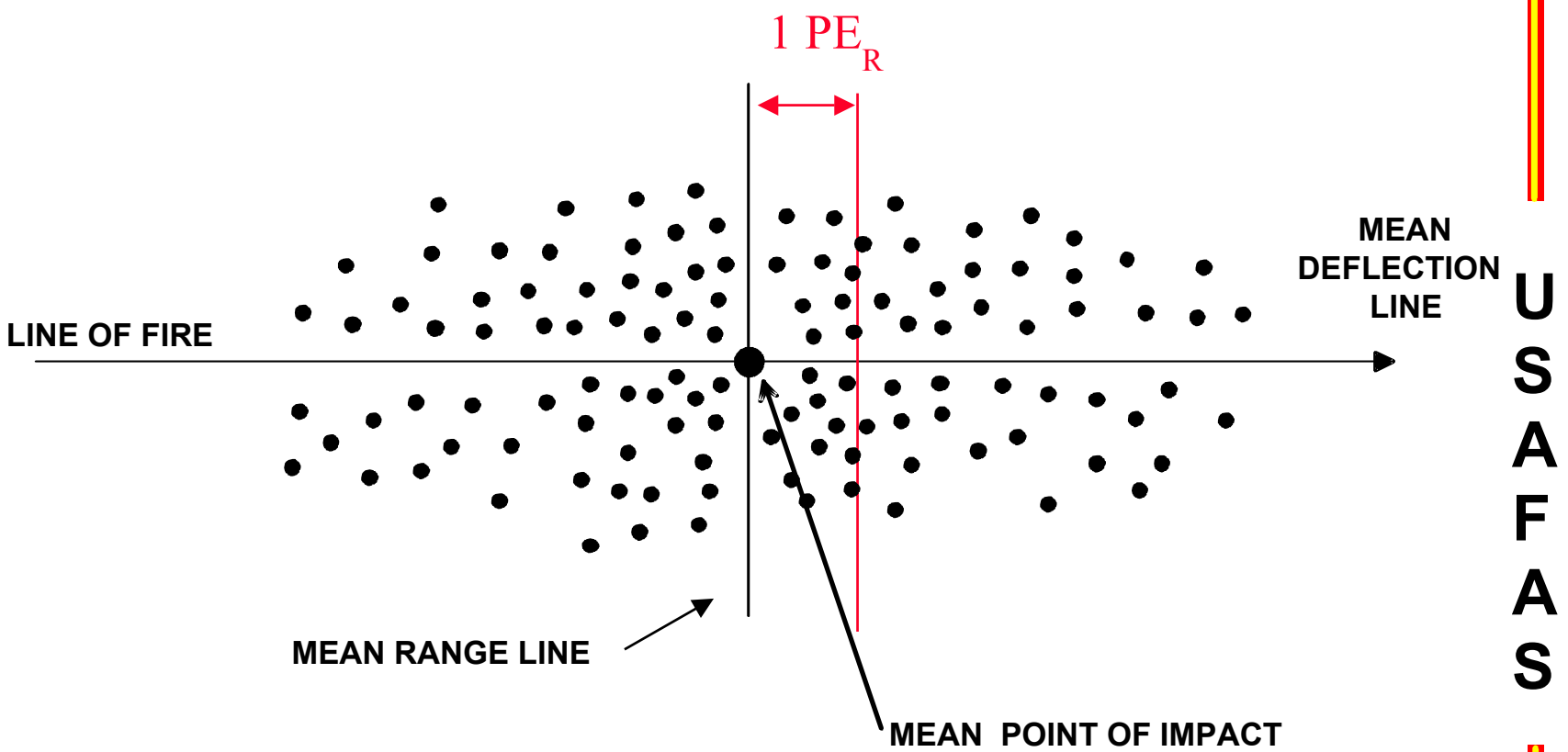
GUNNERY DEPARTMENT



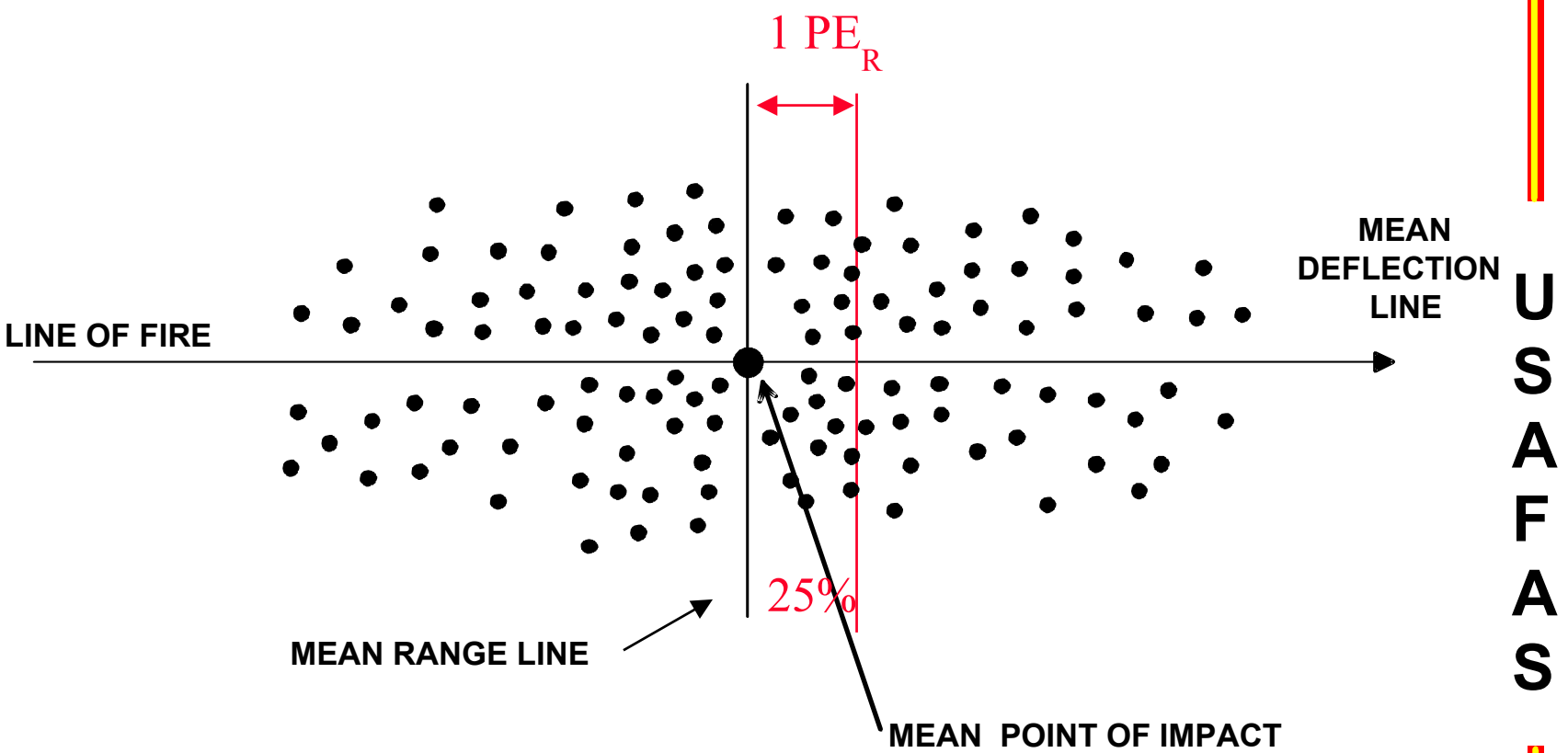
PROBABLE ERROR



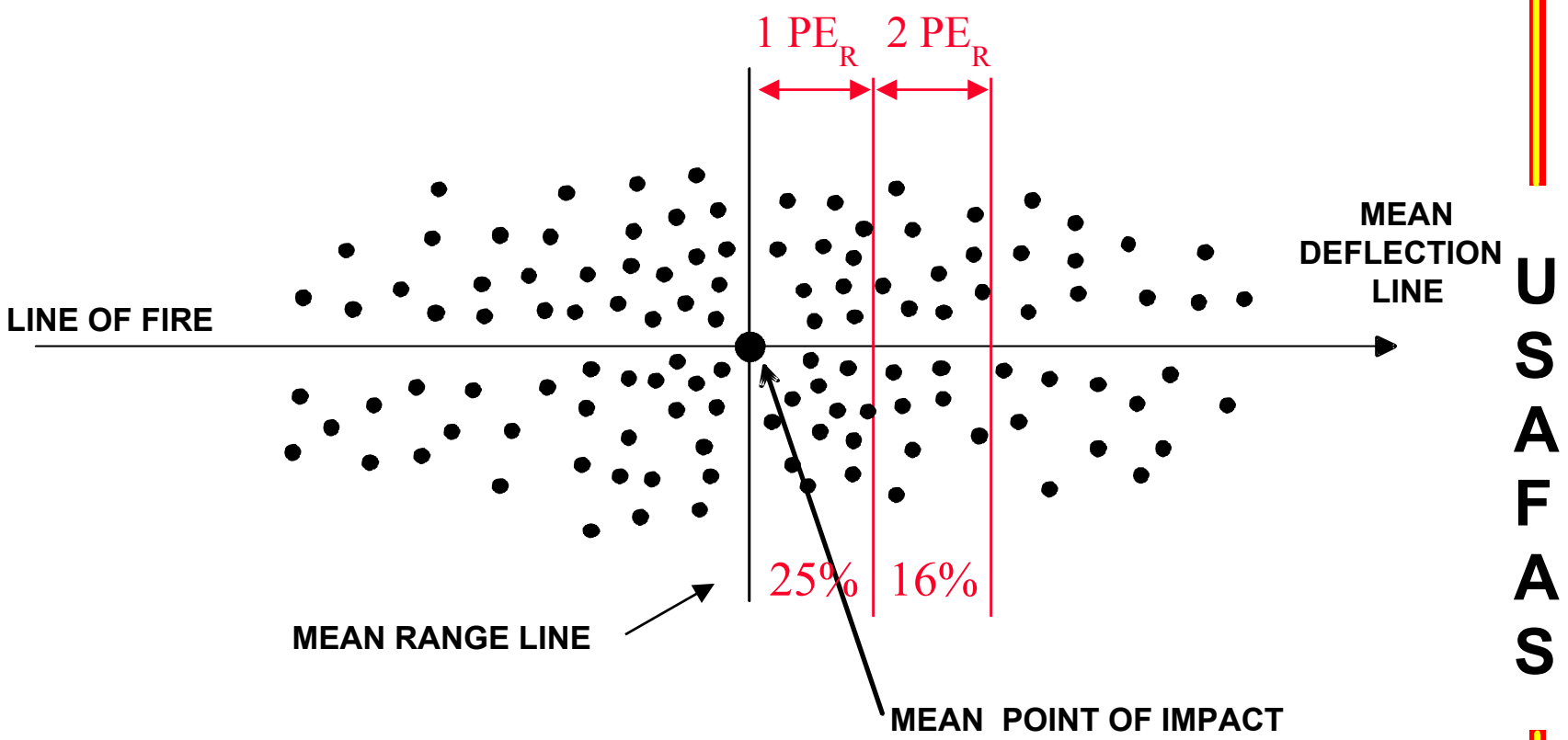
PROBABLE ERROR



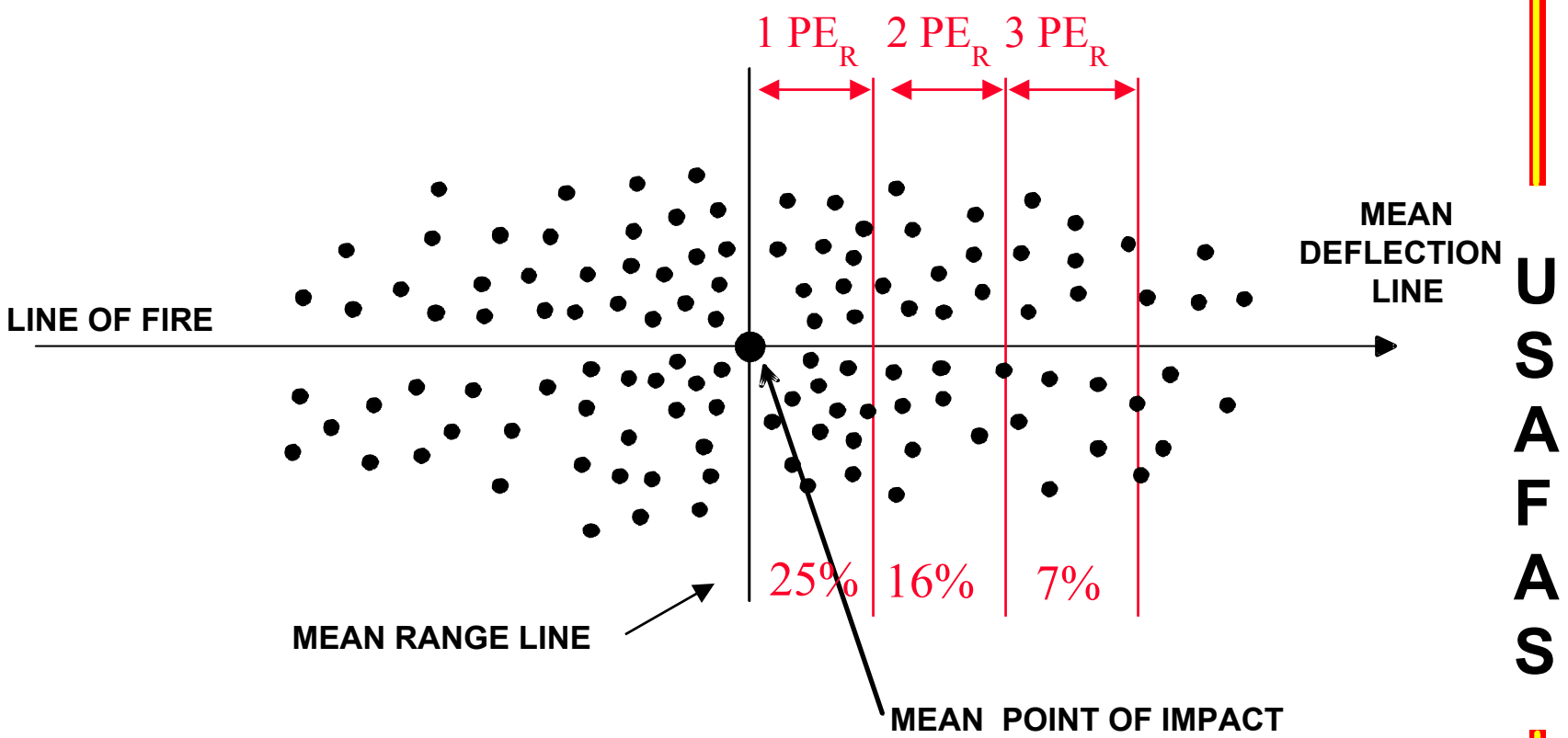
PROBABLE ERROR



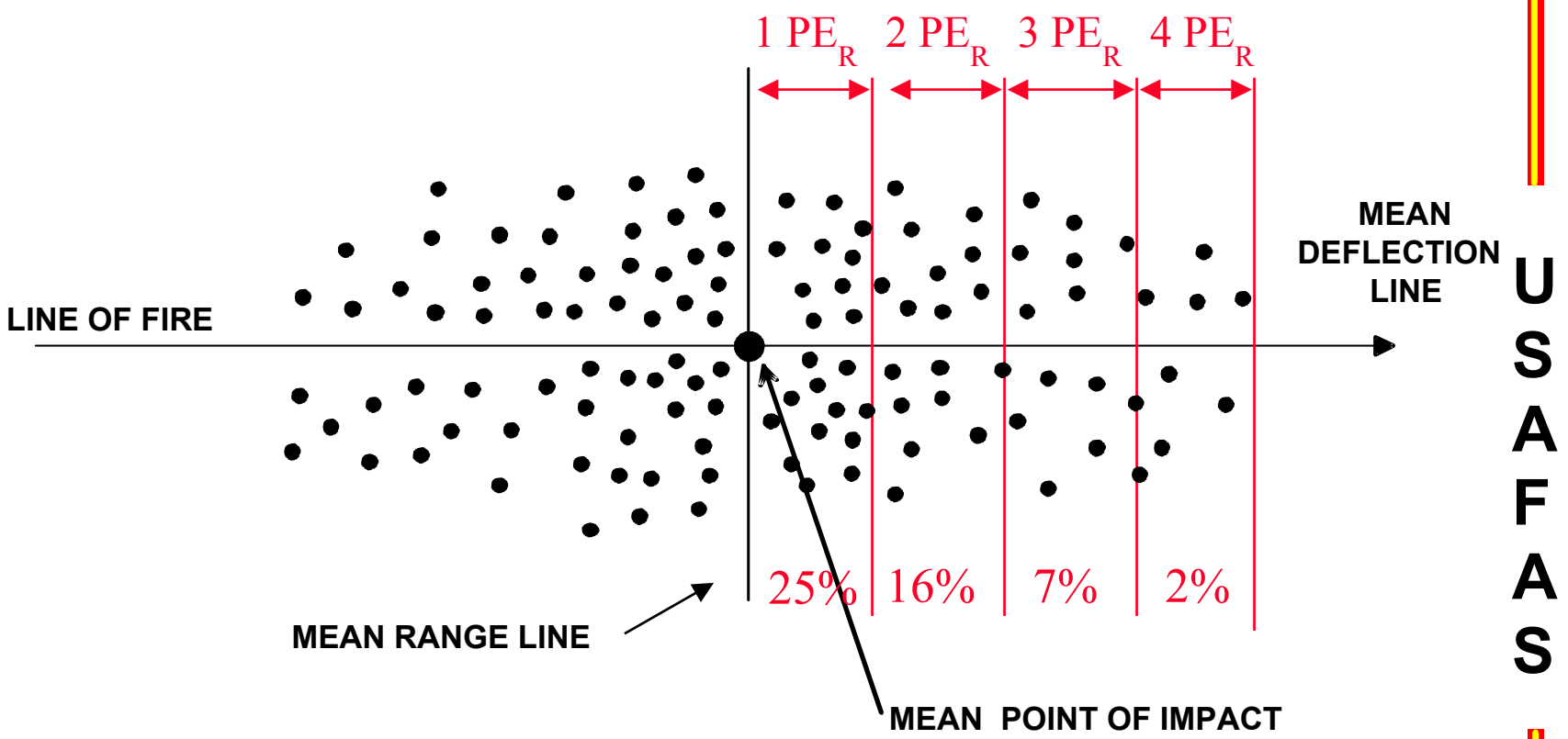
PROBABLE ERROR



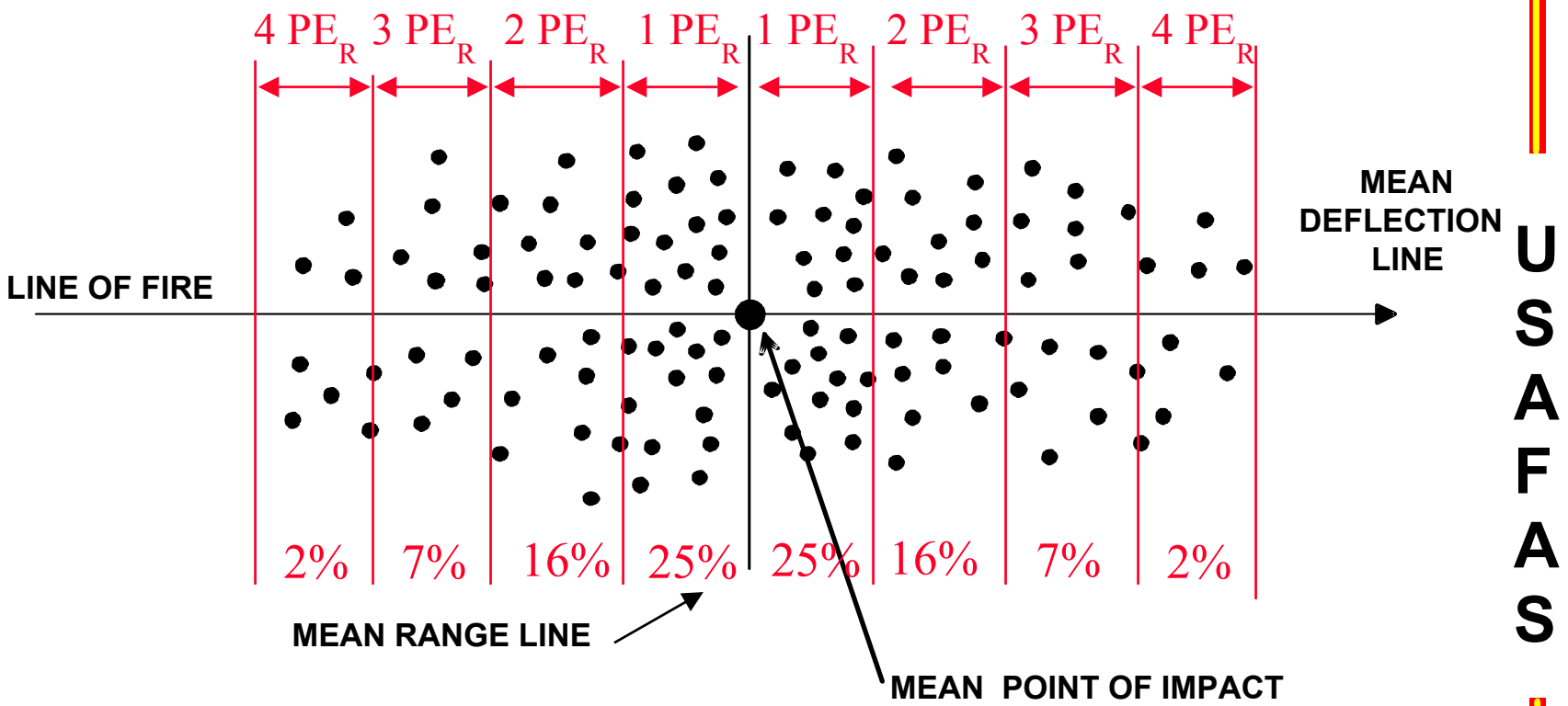
PROBABLE ERROR



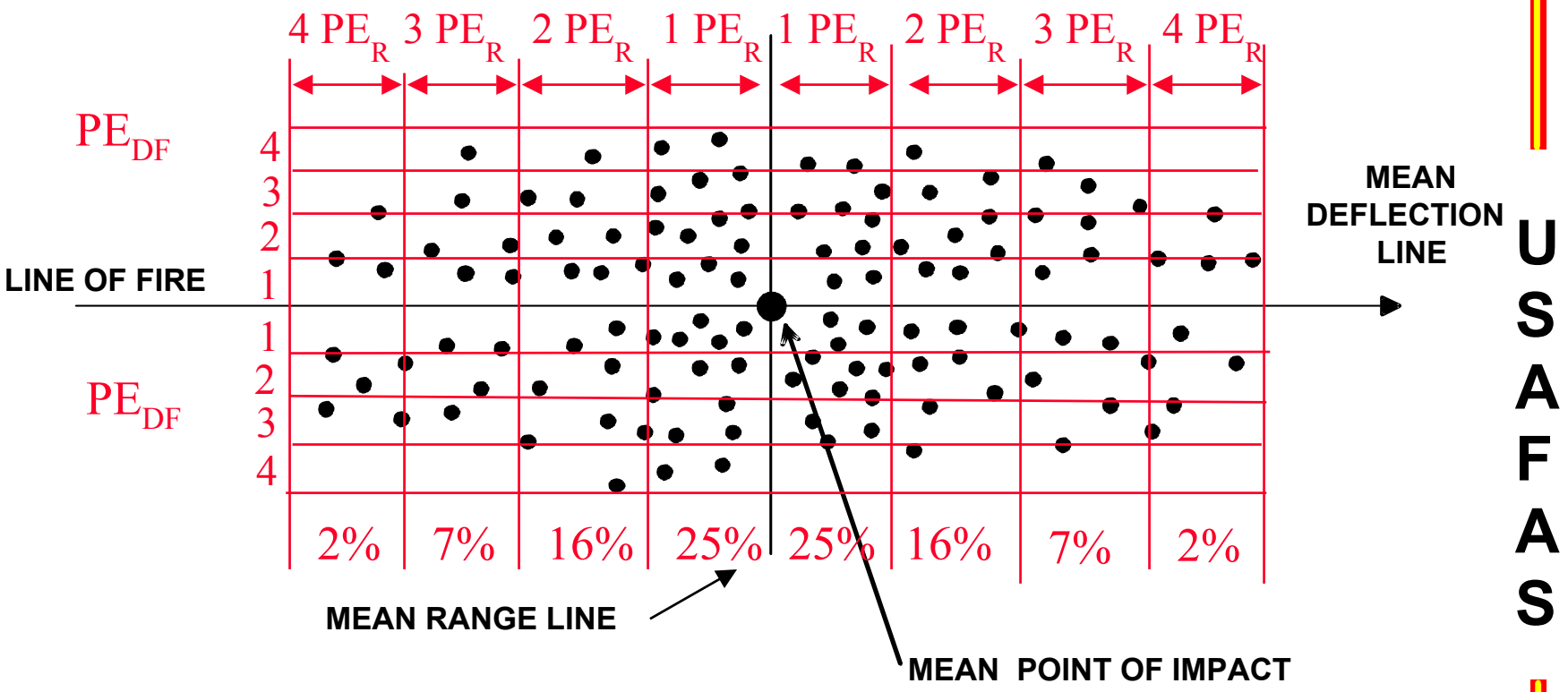
PROBABLE ERROR



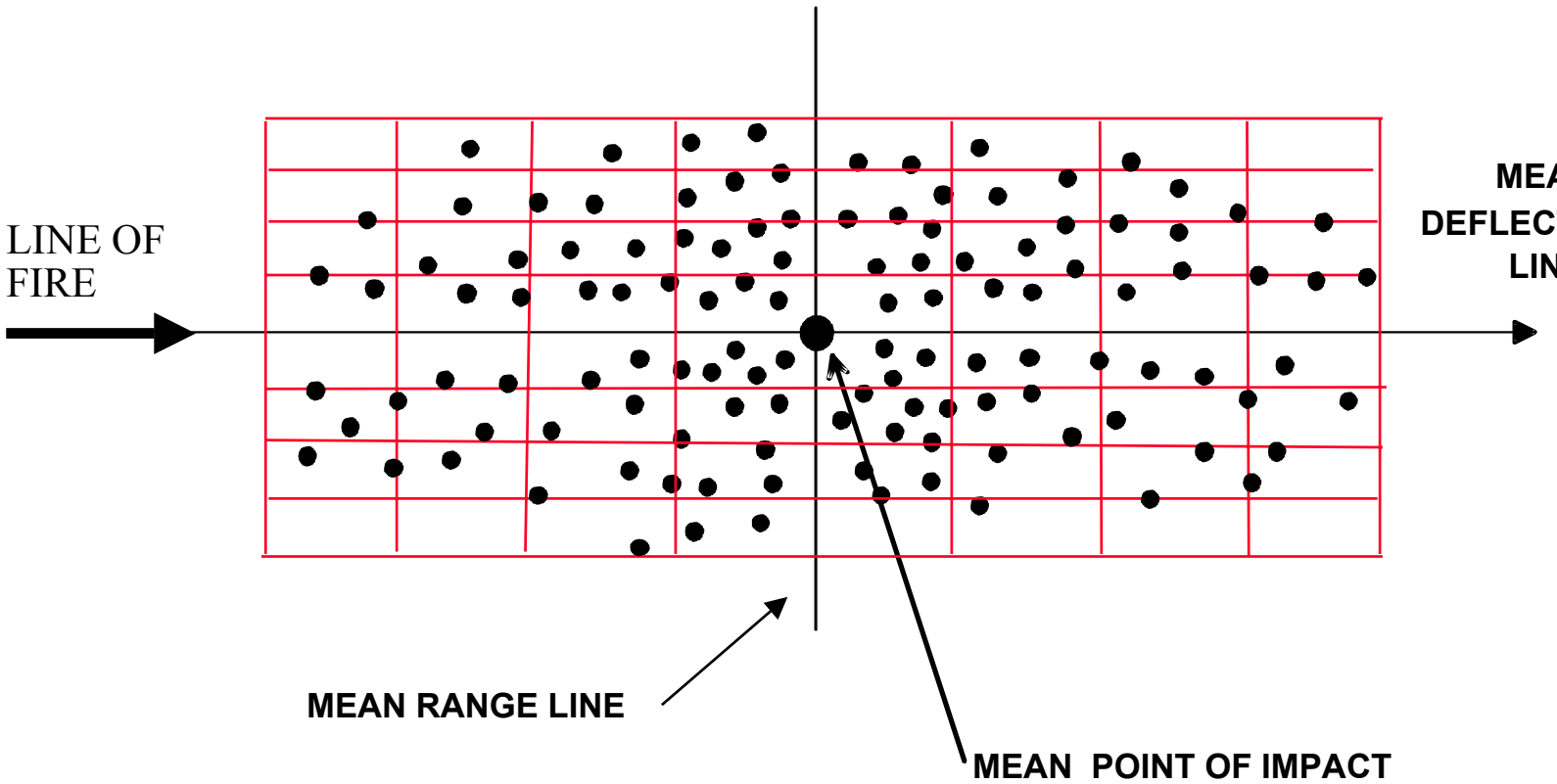
PROBABLE ERROR



PROBABLE ERROR



100 % RECTANGLE

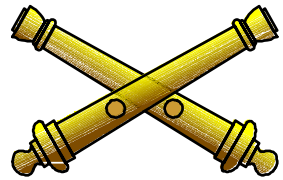


100 % RECTANGLE

	.02	.07	.16	.25	.25	.16	.07	.02
.02	.0004	.0014	.0032	.0050	.0050	.0032	.0014	.0004
.07	.0014	.0049	.0112	.0175	.0175	.0112	.0049	.0014
.16	.0032	.0112	.0256	.0400	.0400	.0256	.0112	.0032
.25	.0050	.0175	.0400	.0625	.0625	.0400	.0175	.0050
.25	.0050	.0175	.0400	.0625	.0625	.0400	.0175	.0050
.16	.0032	.0112	.0256	.0400	.0400	.0256	.0112	.0032
.07	.0014	.0049	.0112	.0175	.0175	.0112	.0049	.0014
.02	.0004	.0014	.0032	.0050	.0050	.0032	.0014	.0004

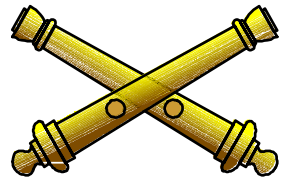
LINE OF FIRE

USAFAS



ASSURANCE OF REGISTRATION VALIDITY

NUMBER OF ROUNDS FIRED	1	2	3	4	5	6
WITHIN 1 PROBABLE ERROR	50%	66%	76%	82%	87%	90%
WITHIN 2 PROBABLE ERRORS	82%	94%	98%	99%	99%	99%



5 STEPS TO IMPROVED FIRING DATA

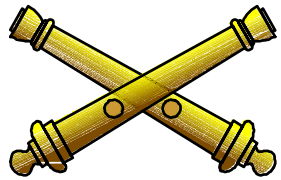
1 CAUSE RDS TO BURST AT POINT OF KNOWN LOCATION

2 DETERMINE SHD AND DHD

3 DETERMINE TOTAL CORRECTIONS

4 ISOLATE **POSITION CONSTANTS**

5 UPDATE TOTAL CORRECTIONS



5 STEPS TO IMPROVED FIRING DATA

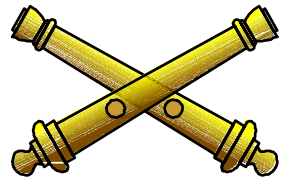
1. CAUSE RDS TO BURST AT POINT OF KNOWN LOCATION

   OBSERVERS DUTY. MUST ACHIEVE OBJECTIVE FOR PRECISION REGISTRATION OR OBSERVE AND SPOT ROUNDS FOR HIGH BURST/MPI

5 STEPS TO IMPROVED FIRING DATA

2. DETERMINE SHD AND DHD

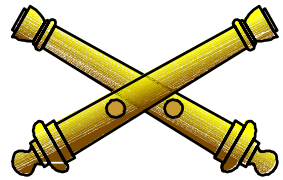
FDC'S DUTY. BY PROCESSING THE MISSION THE FDC DETERMINES SHOULD HIT DATA(SHD) AND DID HIT DATA (DHD) TO THE KNOWN POINT



- SHOULD HIT DATA (SHD)

  (CHART DATA)

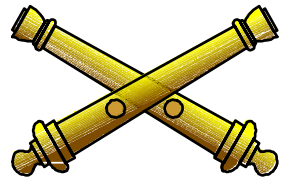
  DATA FIRED UNDER STANDARD CONDITIONS THAT WILL CAUSE THE ROUND TO BURST AT THE POINT OF KNOWN LOCATION



- DID HIT DATA (DHD)

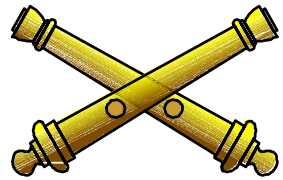
  (ADJUSTED DATA)

  DATA FIRED UNDER NON-STANDARD CONDITIONS THAT WILL CAUSE THE ROUND TO BURST AT THE POINT OF KNOWN LOCATION



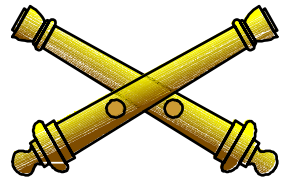
MET CORRECTIONS- (MET)

ALL NON-STANDARD CONDITIONS FOR WHICH WE CAN ACCOUNT. IF IT IS IN THE TFT IT IS A MET CORRECTION



POSITION CONSTANTS- (POS)

NON-STANDARD CONDITIONS WHICH ARE DIFFICULT TO IDENTIFY, RELATIVELY SMALL IN MAGNITUDE AND REMAIN RELATIVELY CONSTANT

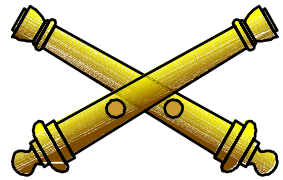


3. DETERMINE TOTAL CORRECTIONS

TOTAL CORRECTIONS (TOT) ARE THE DIFFERENCE BETWEEN DHD AND SHD. ALL TYPES OF REGISTRATIONS YIELD TOTAL CORRECTIONS. DETM GFT SETTING, APPLY TO SUBSEQUENT MISSIONS.

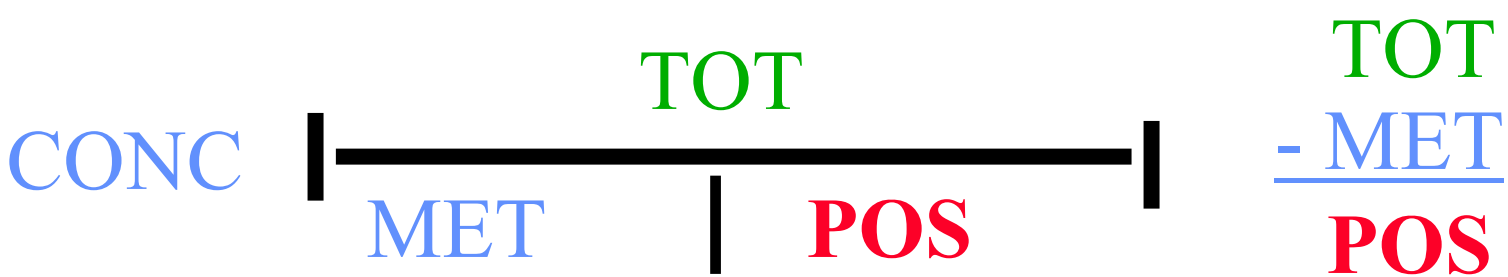
REG — TOT — MET ? | POS ?

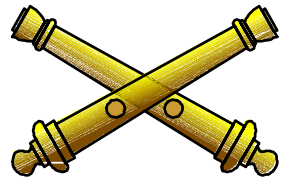
DHD
- SHD
TOT



4. ISOLATE **POSITION CONSTANTS** (CONCURRENT MET TECHNIQUE)

QUANTIFY MET CORRECTIONS
TRANSFER POSITION CONSTANTS

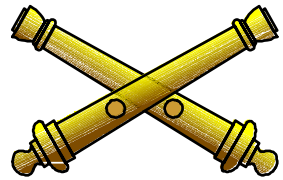




5. UPDATE TOTAL CORRECTIONS (SUBSEQUENT MET TECHNIQUE)

QUANTIFY NEW MET AND ADD TO **POS** TO DETERMINE NEW TOT. UPDATE GFT SETTING.

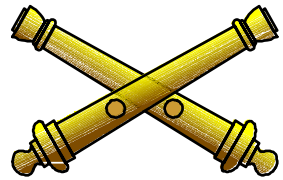
SUBS | NEW TOT / NEW MET \| **POS** | NEW MET +**POS** / NEW TOT



MET MESSAGES

MET MESSAGES

- OBTAINED FROM ARTILLERY MET SECTION VIA RADIO, TELETYPE, HAND-CARRIED, WIRE
- MET DATA DETERMINED USING TWO METHODS
  - ELECTRONIC RADIOSONDE
  - VISUAL PILOT BALLOON

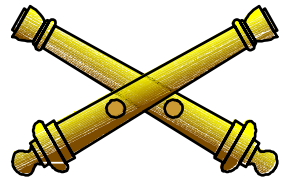


MET MESSAGES

- MET MESSAGE CONTAINS INFORMATION ON AIR TEMPERATURE, DENSITY, PRESSURE, WIND DIRECTION, AND THE WIND SPEED.
- MET MESSAGE CONSISTS OF TWO PARTS
  - INTRODUCTION
  - BODY

GUNNERY DEPARTMENT

BALLISTIC MET



BALLISTIC MET MESSAGE

For use of this form, see FM 6-15; the proponent agency is TRADOC.

IDENTIFICATION	TYPE MSG	OCTANT	LOCATION	DATE	TIME (GMT)	DURATION (HOURS)	STATION HEIGHT (10's M)	MDP PRESSURE % OF STD
METB	K	Q	$L_aL_aL_a$ or xxx $L_oL_oL_o$ or xxx	YY	$G_oG_oG_o$	G	hhh	PPP
METB								

ZONE HEIGHT (METERS)	LINE NUMBER	BALLISTIC WINDS		BALLISTIC AIR	
	ZZ	DIRECTION (100's MILS) dd	SPEED (KNOTS) FF	TEMPERATURE % OF STD TTT	DENSITY % OF STD △△△
SURFACE	00				
200	01				
500	02				
1000	03				
1500	04				
2000	05				
3000	06				
4000	07				
5000	08				
6000	09				
8000	10				
10000	11				
12000	12				
14000	13				
16000	14				
18000	15				

REMARKS

DELIVERED TO: RECEIVED FROM:	TIME (GMT)	TIME (LST)

MESSAGE NUMBER	DATE
RECORDER	**CHECKED**

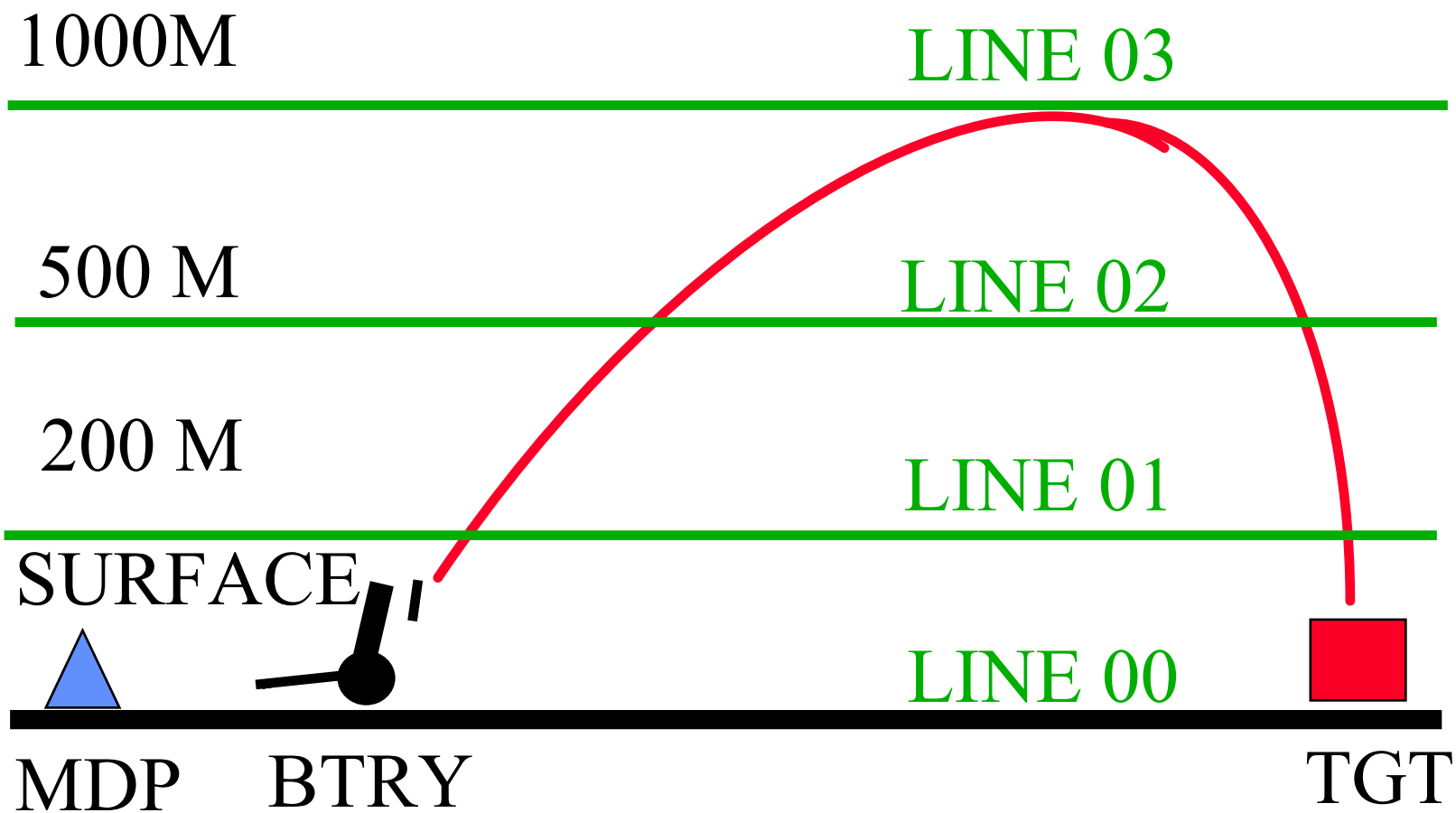
DA FORM 3675
1 JAN 71

REPLACES DA FORM 6-57, 1 MAR 62, WHICH IS OBSOLETE

USAFAS

GUNNERY DEPARTMENT

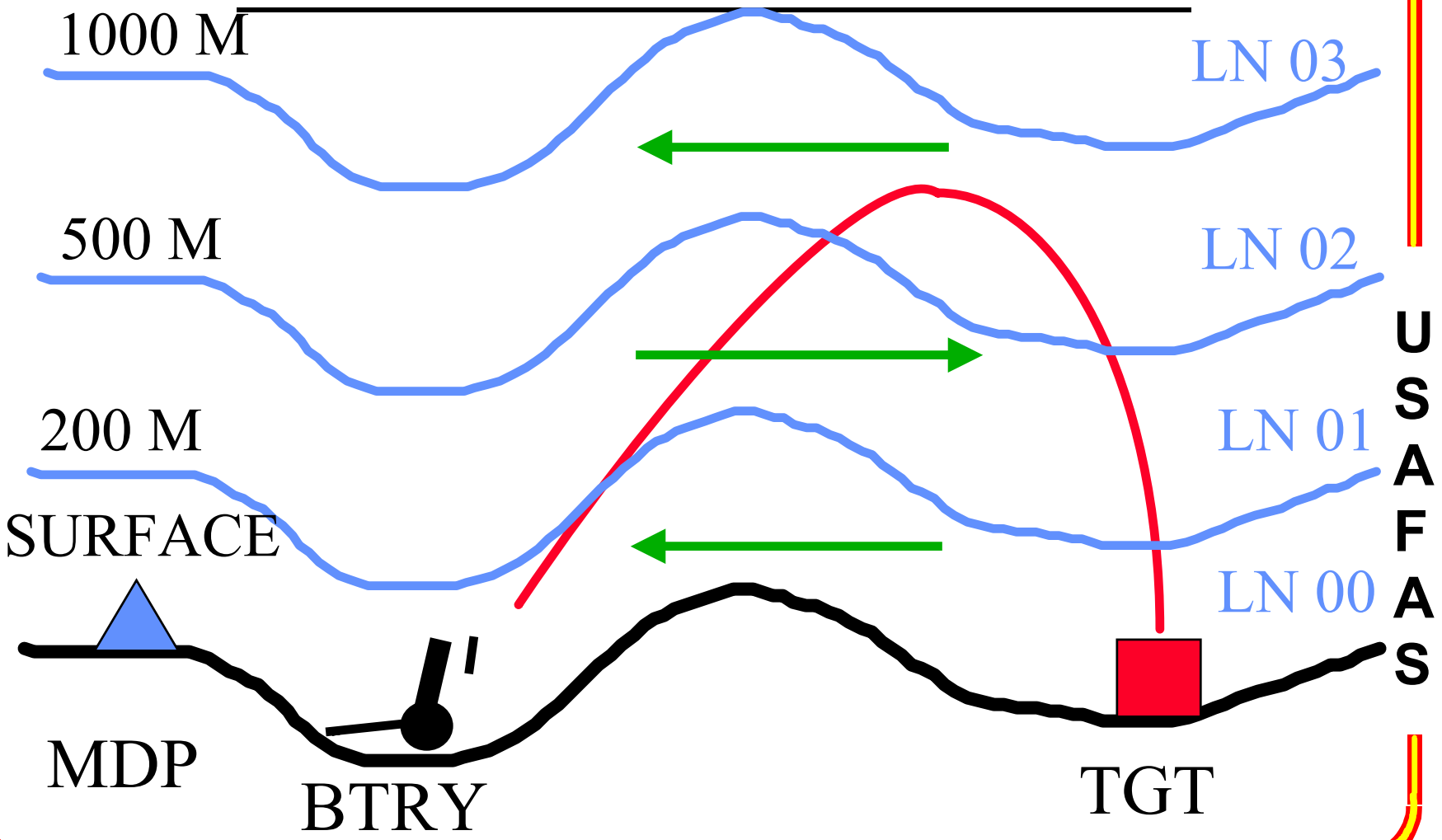
MET LINE NUMBERS



USAFAS

GUNNERY DEPARTMENT

WINDS FOLLOW THE EARTH'S CONTOURS



GUNNERY DEPARTMENT

BALLISTIC MET VALIDITY CHECKS

BALLISTIC MET MESSAGE

For use of this form, see FM 6-15; the proponent agency is TRADOC.

TYPE MSG K	OCTANT Q	LOCATION $L_aL_aL_a$ or xxx $L_oL_oL_o$ or xxx	DATE YY	TIME (GMT) $G_OG_OG_O$	DURATION (HOURS) G	STATION HEIGHT (10's M) hhh	MDP PRESSURE % OF STD PPP

LINE NUMBER ZZ	BALLISTIC WINDS		BALLISTIC AIR	
	DIRECTION (100's MILS) dd	SPEED (KNOTS) FF	TEMPERATURE % OF STD TTT	DENSITY % OF STD
00				
01				
02				
03				
04				
05				

OVER 1,000m

OVER 10 KNOTS

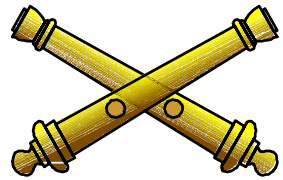
OVER 2 PERCENT

BOTH DECREASING

USAFAS

GUNNERY DEPARTMENT

COMPUTER MET



USAFAS

COMPUTER MET MESSAGE

For use of this form, see FM 6-15; the proponent agency is TRADOC.

IDENTIFICATION METCM	OCTANT Q	LOCATION $L_aL_aL_a$ or xxx / $L_oL_oL_o$ or xxx	DATE YY	TIME (GMT) $G_oG_oG_o$	DURATION (HOURS) G	STATION HEIGHT (10's M) hhh	MDP PRESSURE % OF STD PPP
METCM							

ZONE HEIGHT (METERS)	LINE NUMBER zz	ZONE VALUES: WIND DIRECTION (10's MILS) ddd	WIND SPEED (KNOTS) FFF	TEMPERATURE ($1/10^{2}$ K) TTTT	PRESSURE (MILLIBARS) PPPP
SURFACE	00				
200	01				
500	02				
1000	03				
1500	04				
2000	05				
2500	06				
3000	07				
3500	08				
4000	09				
4500	10				
5000	11				
6000	12				
7000	13				
8000	14				
9000	15				
10000	16				
11000	17				
12000	18				
13000	19				
14000	20				
15000	21				
16000	22				
17000	23				
18000	24				
19000	25				
20000	26				

FROM TO	DATE & TIME (GMT)	DATE & TIME (LST)
MESSAGE NUMBER	RECORDER	CHECKED

DA FORM 1 JAN 71 3677

REPLACES DA FORM 6-59, 1 MAR 62, WHICH IS OBSOLETE

GUNNERY DEPARTMENT

COMPUTER MET VALIDITY CHECKS

COMPUTER MET MESSAGE
For use of this form, see FM 6-15; the proponent agency is TRADC.

OCTANT Q	LOCATION $L_aL_aL_a$ or xxx	LOCATION $L_oL_oL_o$ or xxx	DATE YY	TIME (GMT) $G_oG_oG_o$	DURATION (HOURS) G	STATION HEIGHT (10's M) hhh	MDP PRESSURE % OF STD PPP

LINE NUMBER zz	ZONE VALUES: WIND DIRECTION (10's MILS) ddd	WIND SPEED (KNOTS) FFF	TEMPERATURE (1/10°K) TTTT	PRESSURE (MILLIBARS) PPPP
00				
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				

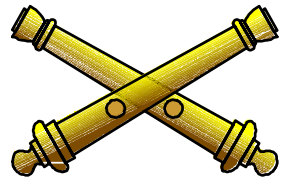
OVER 1000m CHANGE

OVER 10 KNOTS

DRASTIC CHANGE of 20° more

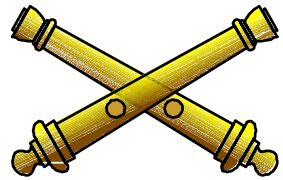
PRESSURE INCREASE

USAFAS



MET MESSAGE PREFERENCE

- CURRENT MET MESSAGE FROM A STATION WITHIN 2O KM OF MIDPOINT OF TRAJECTORY
- CURRENT MET MESSAGE FROM THE NEAREST STATION, UP TO 80 KM FROM THE TRAJECTORY'S MIDPOINT, AND LESS THAT 2 HOURS OLD



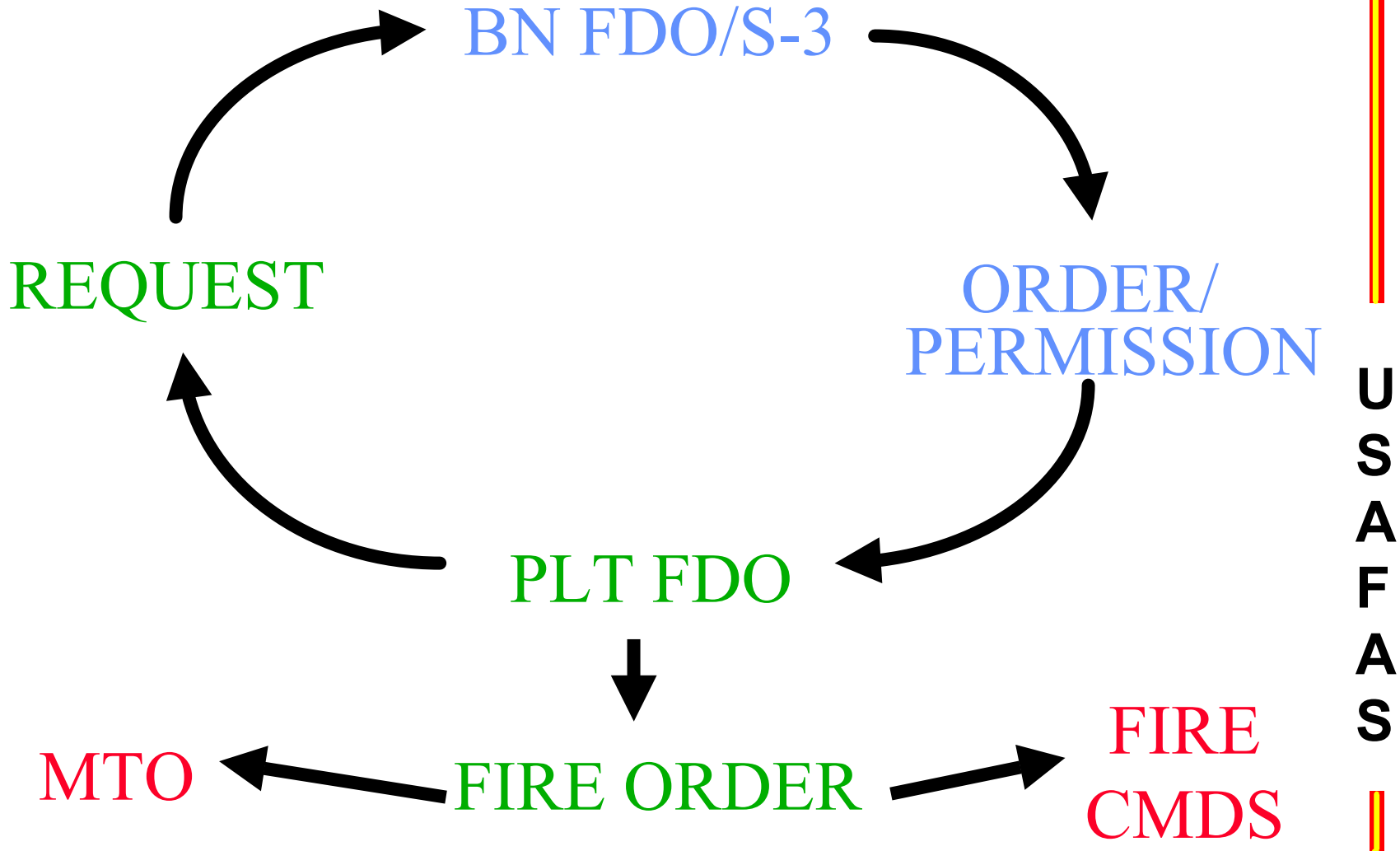
MET MESSAGE PREFERENCE

- MESSAGE OVER 2 HOURS OLD BUT FROM A STATION 20 KM FROM THE TRAJECTORY'S MIDPOINT
- MOUNTAINOUS TERRAIN 10 KM, DISTANCES REDUCED INLAND OF COASTAL AREAS AND LARGE BODIES OF WATER BY 25%
- 4 HR MET USED EXCEPT DURING TRANSITION FROM DAY TO NIGHT AND FRONTAL PASSAGE

REGISTRATIONS

GUNNERY DEPARTMENT

REGISTRATION DECISION



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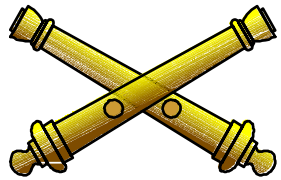


REGISTRATION FIRE ORDER

- **WHAT** TYPE OF REGISTRATION
- **WHERE** IS THE REGISTRATION TO BE CONDUCTED, INCLUDING ALTITUDE AND HOB (IF APPROPRIATE)
- **WITH WHOM,** WHICH OBSERVER OR OBSERVERS
- **WITH WHAT FIRE ORDER CONSIDERATIONS**
  - REGISTERING HOWITZER
  - METHOD OF FIRE
  - AMMUNITION LOT
  - CHARGE
  - FUZES TO REGISTER
  - SPECIAL INSTRUCTIONS

PRECISION REGISTRATION REQUIRES:

- A CLEARLY DEFINED KNOWN POINT
- 4 SPOTTINGS PER PHASE, Q & TI
- GOOD WEATHER AND VISIBILITY
- 10 - 15 ROUNDS AND 20 - 30 MINUTES

PRECISION REGISTRATION

- FDC INITIATES REG WITH A FIRE ORDER AND MTO
- OBSERVER IDENTIFIES KN PT AND TRANSMITS DIRECTION
- FDC DETERMINES INITIAL DATA AND FIRES INITIAL ROUND
- INITIAL ROUND DOES NOT BURST AT THE KNOWN POINT


KN PT


INITIAL BURST


GUN


OBS

USAFAS

PRECISION REGISTRATION

- OBSERVER ADJUSTS TO THE KN PT
- OBS OBTAINS SPOTTINGS OF TWO OVERS AND TWO SHORTS WITH THE SAME DATA OR DATA 25 M APART, AND CORRECTS MBL TO THE KN PT
- OBS CORRECTS THE MEAN HOB OF 4 ROUNDS FIRED WITH THE SAME DATA TO 20 M ABOVE THE KNOWN POINT

AIM PT

REFINED MBL

KN PT

INITIAL BURST

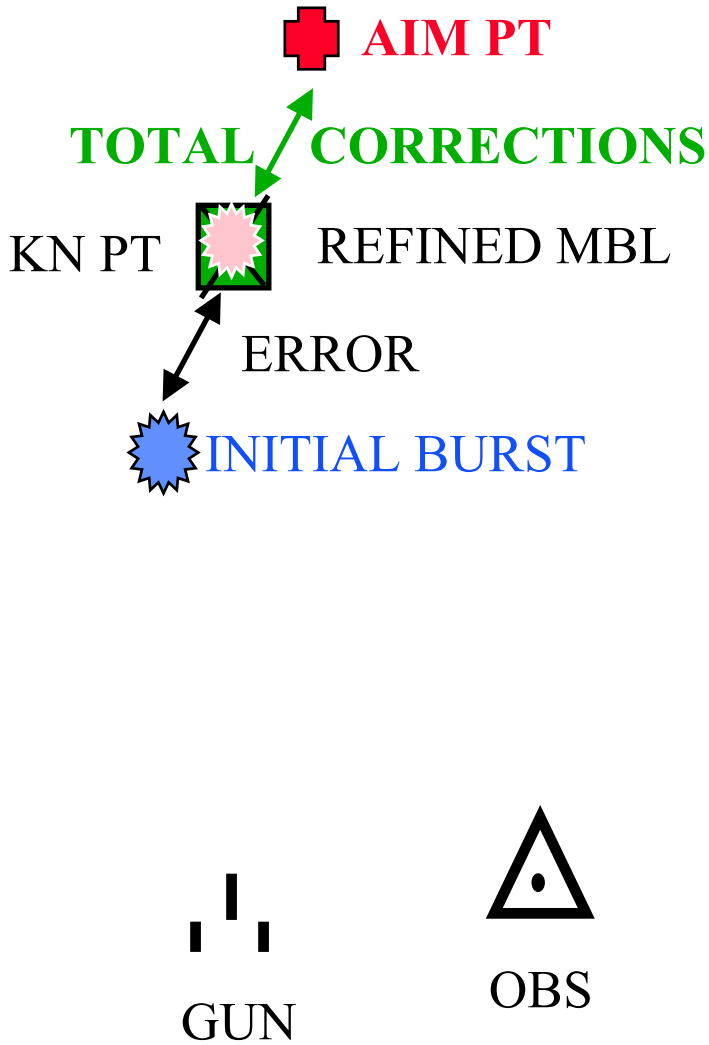
USAFAS

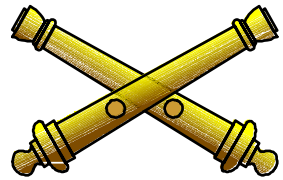
GUN

OBS

PRECISION REGISTRATION

- FDC DETERMINES THE DIFFERENCE BETWEEN THE INITIAL DATA (SHD) AND THE FINAL DATA (DHD)TO THE KN PT
- THIS DIFFERENCE IS TOTAL CORRECTIONS, AND IS APPLIED IN THE FORM OF A GFT SETTING



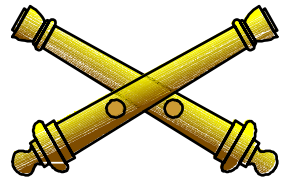


REGISTRATION TRANSFER LIMITS

GFT SETTING APPLICATION

The TOTAL CORRECTIONS determined from a REGISTRATION are applied to a GFT based on the following criteria:

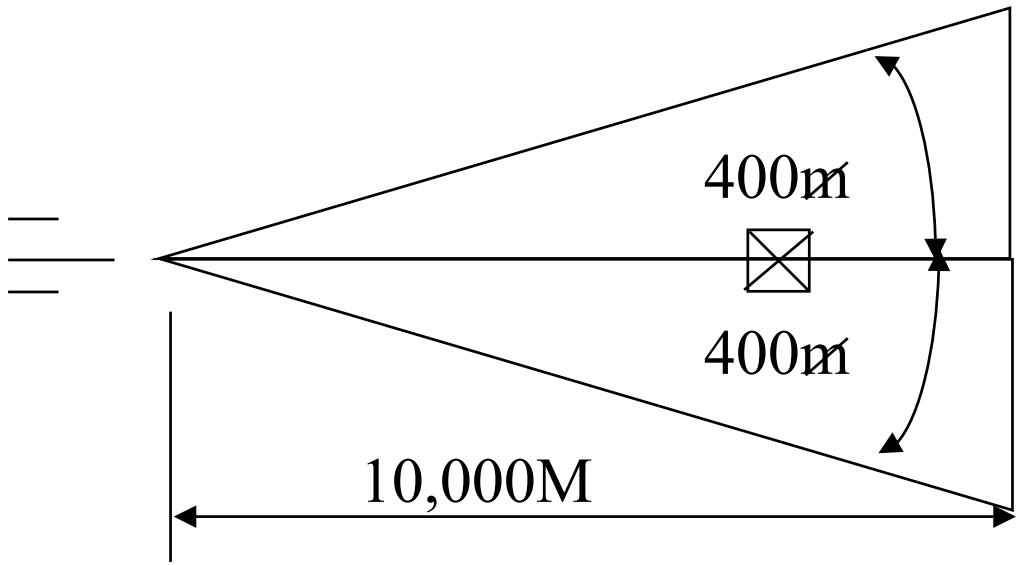
- Same Projectile Family as REG
- Same Propellant Lot as REG
- Same Charge as REG
- Same Angle of Fire as REG



RANGE TRANSFER LIMITS

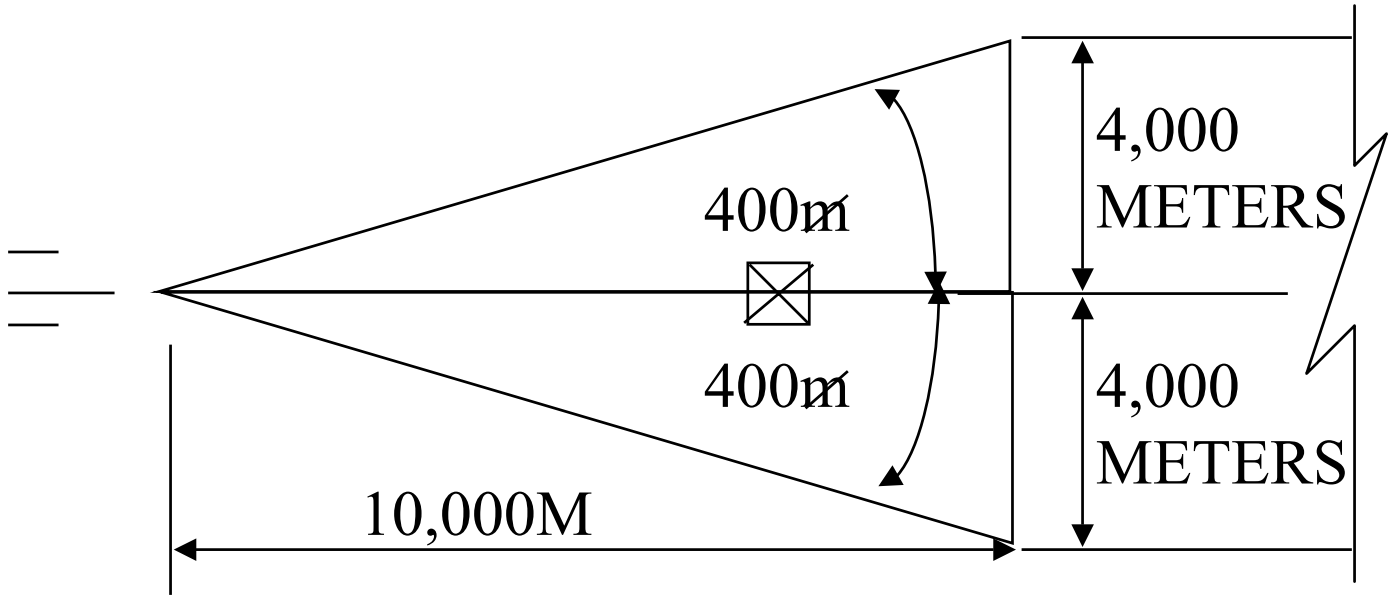
- THE RANGE TRANSFER LIMITS FOR A ONE-PLOT GFT SETTING ARE SHOWN ON THE GFT CORRESPONDING TO THE RED NUMBERED ELEVATIONS.
- THE RANGE TRANSFER LIMITS FOR A TWO-PLOT GFT SETTING ARE BETWEEN THE TWO RANGES USED TO APPLY THE GFT SETTING(S). (LESS ACCURATE OUTSIDE THESE TWO RANGES)
- THE RANGE TRANSFER LIMITS FOR A MULTIPLOT GFT SETTING ARE ELIMINATED WHEN 3 OR MORE SET OF CORRECTIONS ARE AVAILABLE FOR THE SAME CHARGE.

DEFLECTION TRANSFER LIMITS

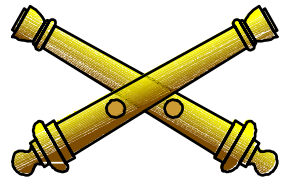


- WHEN THE CHART RANGE TO A TARGET IS 10,000 METERS OR LESS, THE TOTAL CORRECTIONS ARE VALID IN AN AREA 400 MILS LEFT AND RIGHT OF THE AZIMUTH TO THE KNOWN POINT.

DEFLECTION TRANSFER LIMITS



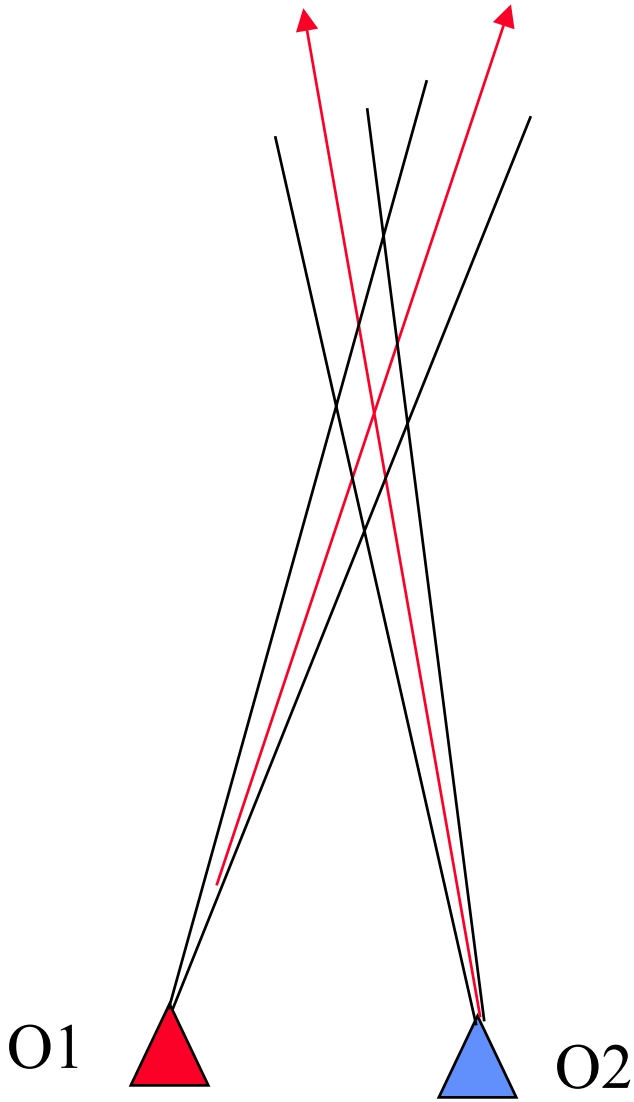
- WHEN THE CHART RANGE TO A TARGET IS 10,000 METERS OR MORE, THE TOTAL CORRECTIONS ARE VALID IN A CORRIDOR 4000 METERS LEFT AND RIGHT OF THE AZIMUTH TO THE REGISTRATION POINT



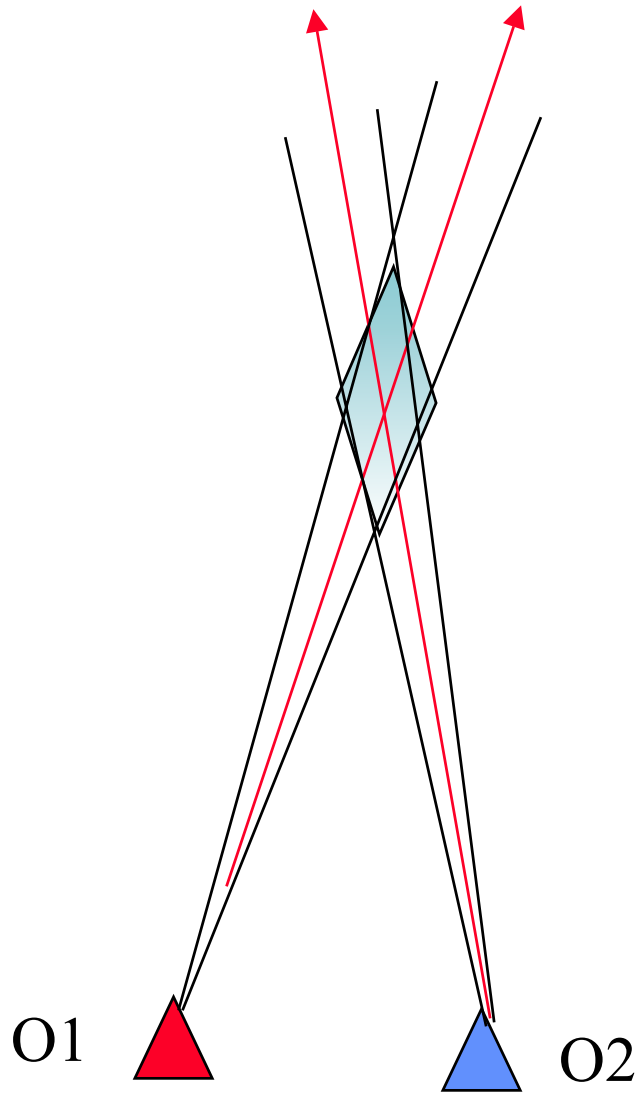
HIGH BURST/MPI REGISTRATION REQUIRES

- 2 SURVEYED OP'S
- ORIENTING POINT VISIBLE TO 2 OBSERVERS
- SIX USABLE ROUNDS
- EACH OBSERVER SPOTS FOR DIRECTION ON EACH ROUND, 1 SPOTS FOR VERTICAL ANGLE
- MUST MEET APEX ANGLE CRITERIA

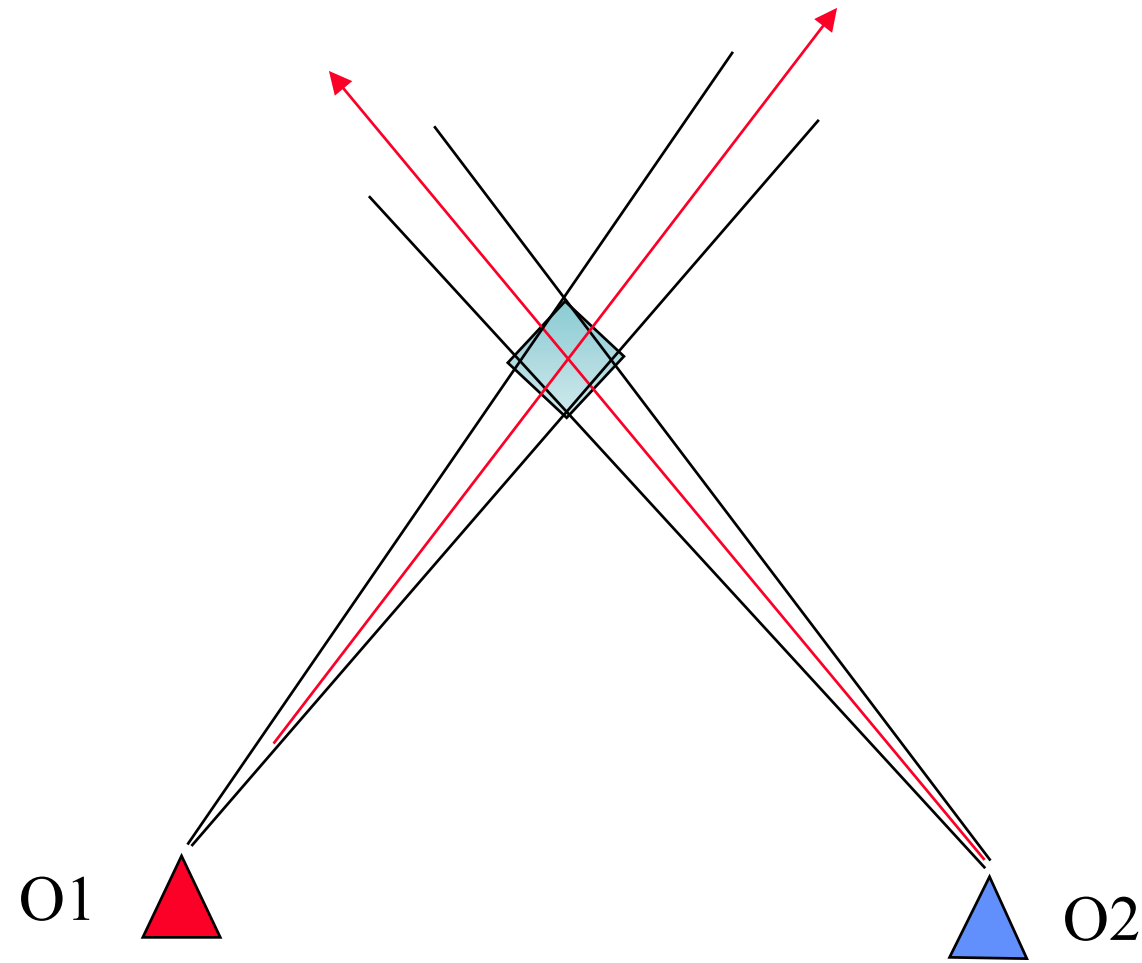
EFFECT OF APEX ANGLE ON ACCURACY

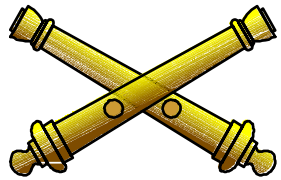


EFFECT OF APEX ANGLE ON ACCURACY



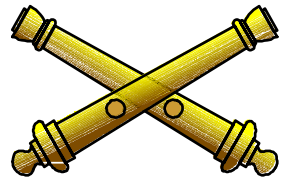
EFFECT OF APEX ANGLE ON ACCURACY





APEX ANGLE CRITERIA

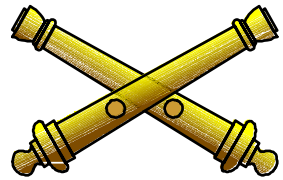
- MINIMUM APEX ANGLE 150 MILS
- ACCEPTABLE - 150 TO 3050 MILS
- PREFERRED - 300 TO 2900 MILS
- OPTIMUM - 1067 MILS



SELECTION OF ORIENTING POINT

MPI

- MPI CLOSE TO CENTER OF ZONE OF ACTION
- MPI IN LEVEL AREA VISIBLE TO BOTH O1 & O2



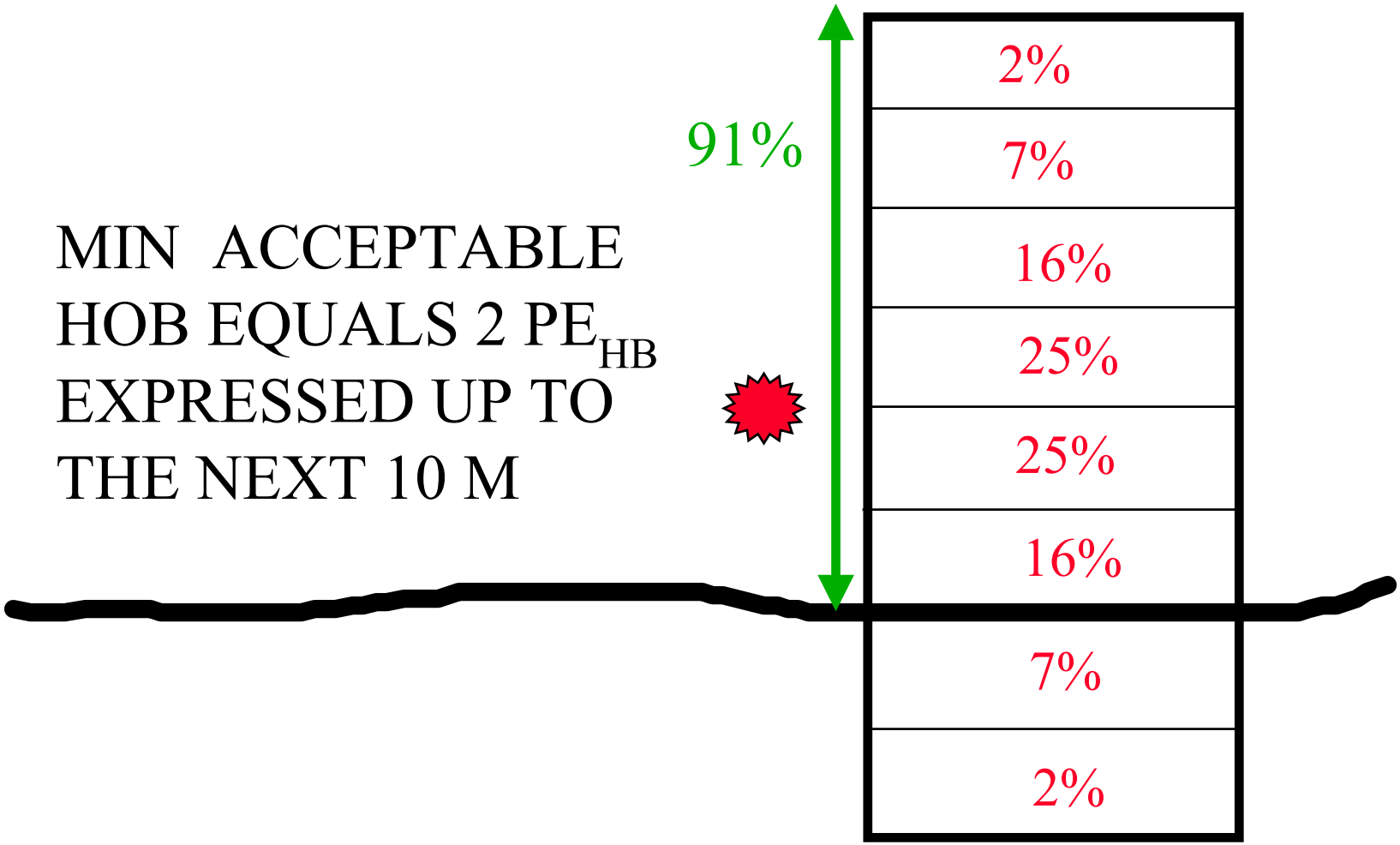
SELECTION OF ORIENTING POINT

HIGH BURST

- HB OVER THE CENTER OF ZONE OF ACTION
- BURST HIGH ENOUGH TO BE VISIBLE TO O1 & 02
- BURST HIGH ENOUGH TO ENSURE AN AIRBURST

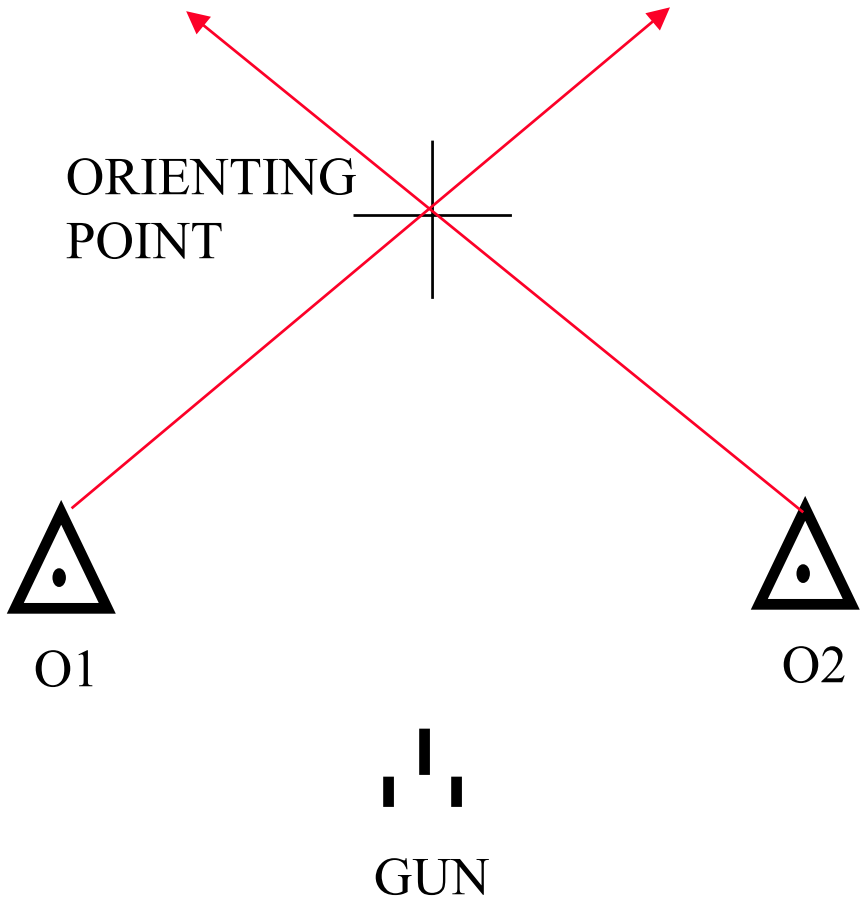
HEIGHT OF BURST SELECTION

MIN ACCEPTABLE HOB EQUALS 2 PE_{HB} EXPRESSED UP TO THE NEXT 10 M



HIGH BURST/MPI REGISTRATION

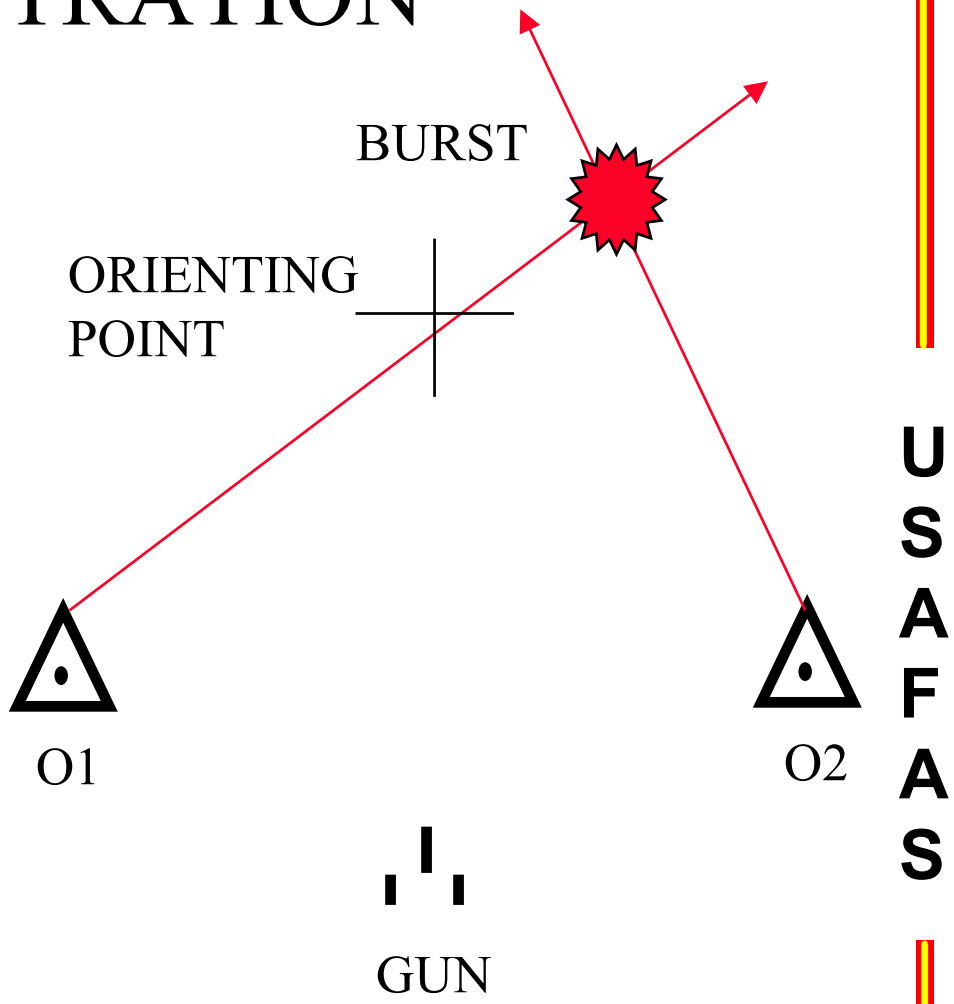
- FDC CHOOSES A CONVENIENT ORIENTING POINT
- FDC DETERMINES AND TRANSMITS ORIENTING DATA TO TWO SURVEYED OBSERVERS
- OBS REPORT WHEN READY TO OBSERVE



USAFAS

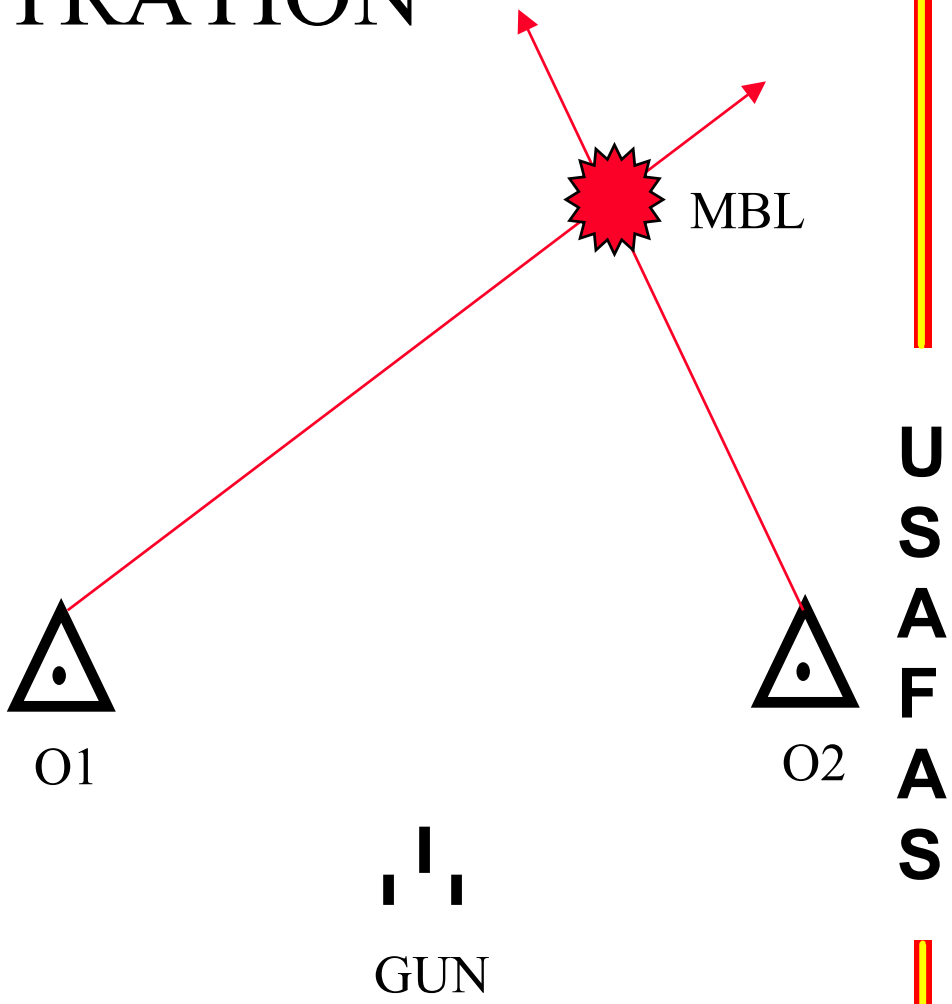
HIGH BURST/MPI REGISTRATION

- FDC DETERMINES INITIAL DATA AND FIRES THE 1ST ROUND
- THE ROUND DOES NOT BURST AT THE ORIENTING POINT
- OBS TRANSMIT SPOTTINGS TO FDC - DIRECTION AND VA



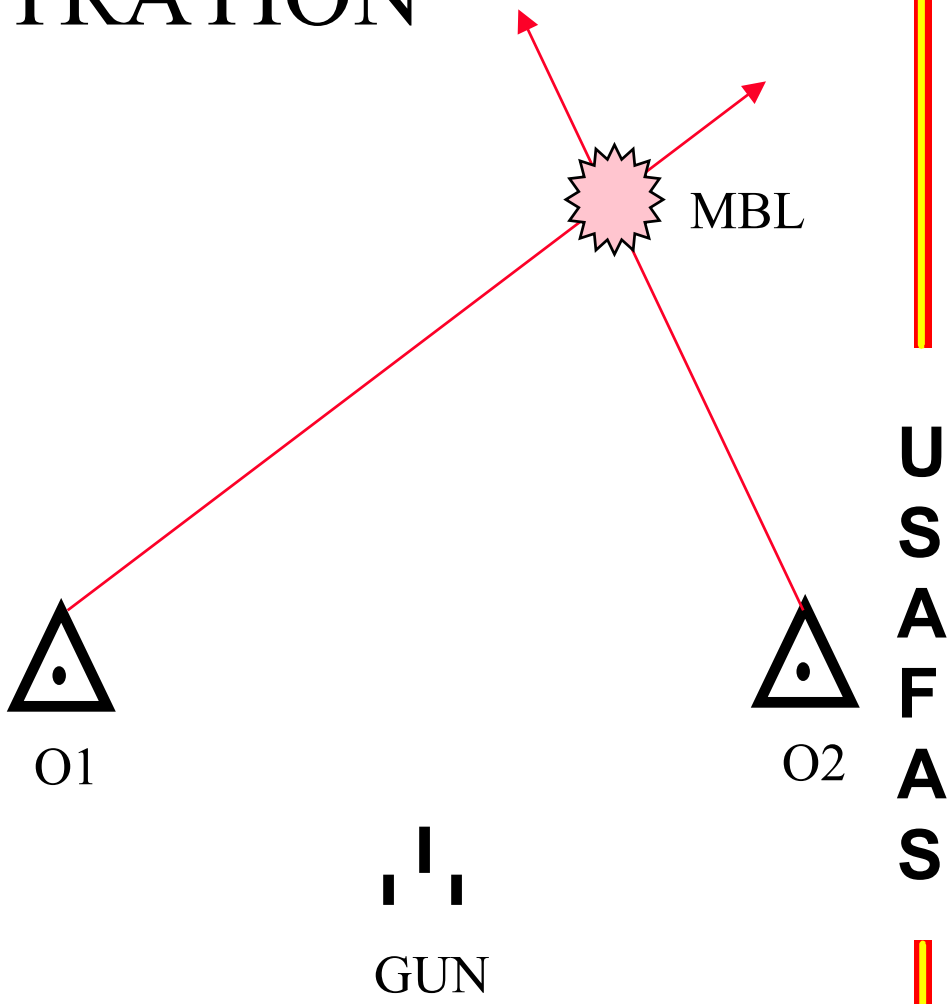
HIGH BURST/MPI REGISTRATION

- FDC FIRES REMAINING ROUNDS WITH THE SAME DATA (DHD)
- OBS TRANSMIT SPOTTINGS TO FDC - DIRECTION AND VA FOR ALL ROUNDS
- FDC DETERMINES MEAN BURST LOCATION (MBL) BY AVERAGING ALL REASONABLE SPOTTINGS

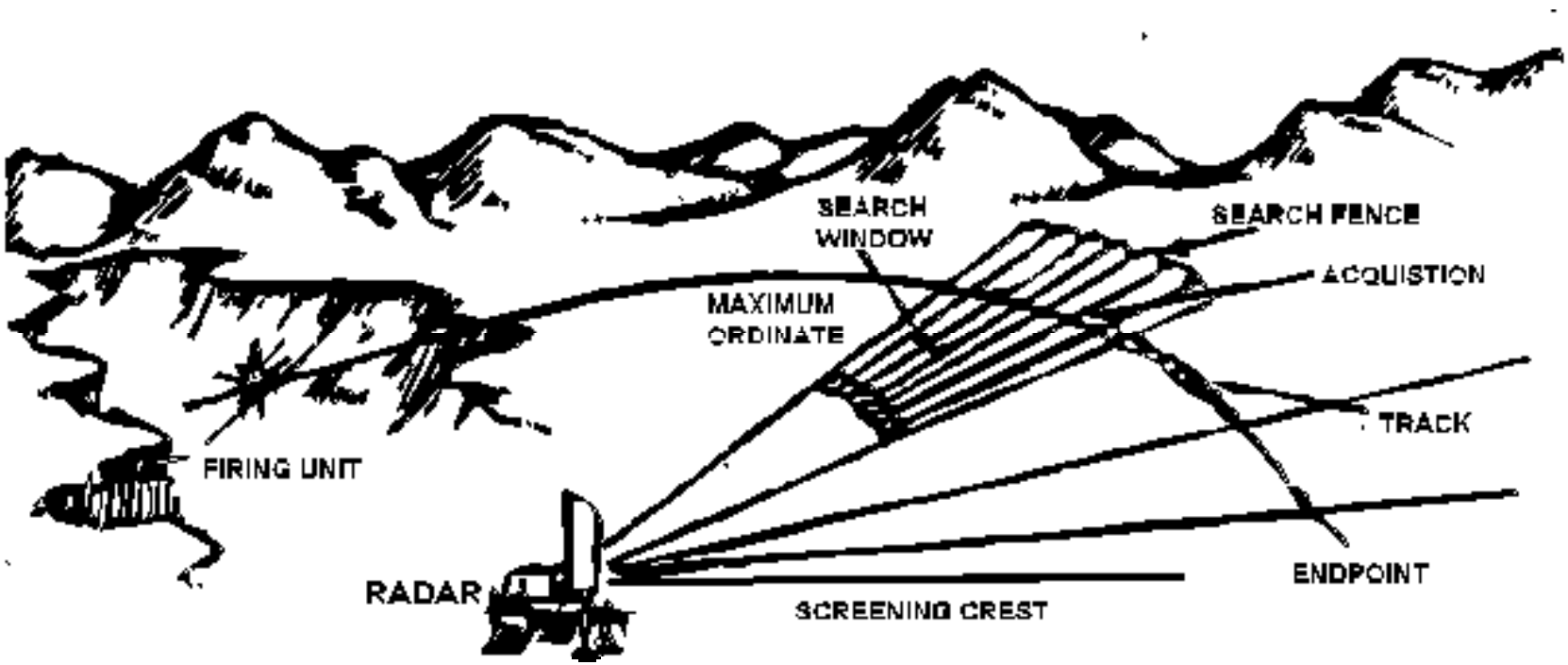


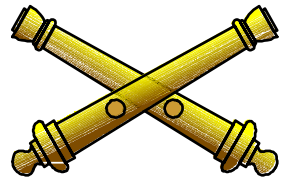
HIGH BURST/MPI REGISTRATION

- FDC DETERMINES CHART DATA TO THE MBL (SHD)
- FDC DETERMINES DIFFERENCE BETWEEN DHD AND SHD - THIS IS TOTAL CORRECTIONS
- TOTAL CORRECTIONS ARE THEN APPLIED IN THE FORM OF A GFT SETTING



RADAR MPI REGISTRATION





ABBREVIATED REGISTRATIONS

- ANY TYPE OF REGISTRATION CAN BE CONDUCTED AS AN ABBREVIATED REGISTRATION
- LESS THAN THE RECOMMENDED NUMBER OF ROUNDS ARE USED TO CONDUCT THE REGISTRATION
- TOTAL CORRECTIONS DERIVED HAVE A LESSER ASSURANCE OF VALIDITY
- PROCEDURES OFTEN BASED ON UNIT SOP